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ABSTRACT

Provided for teachers and the general adult reader is an annotated and graded list of books and reference materials dealing with aerospace subjects. Only non-fiction books and pamphlets that need to be purchased from commercial or government sources are included. Free industrial materials and educational aids are not included because they tend to have a transitory availability. Books and reference materials are listed, alphabetically by author, in the subject matter index (part 1). Major subject areas are: space exploration; impacts of space exploration; future space activities; astronomy; exobiology (life beyond earth); aeronautics; energy; space and the humanities; and aerospace education. Suggested reading/usage levels, designated by codes, are also provided in part 1. Codes include P-primary (grades 1-3), I-intermediate (grades 4-6), U-upper (grades 7-8), S-secondary (grades 9-12), and U-adult/college level. Most books of general interest to the public at the adult level are also listed for secondary. Part 2 contains an annotated list, arranged alphabetically by author, of all books/materials cited in the subject index. Author(s), title, source, number of pages, International Standard Book Number (ISBN), and annotation are provided for each entry. Likewise, the same information is provided for reference materials (guides, annuals, atlases, bibliographies, dictionaries, and encyclopedias) in part 3. (JN)

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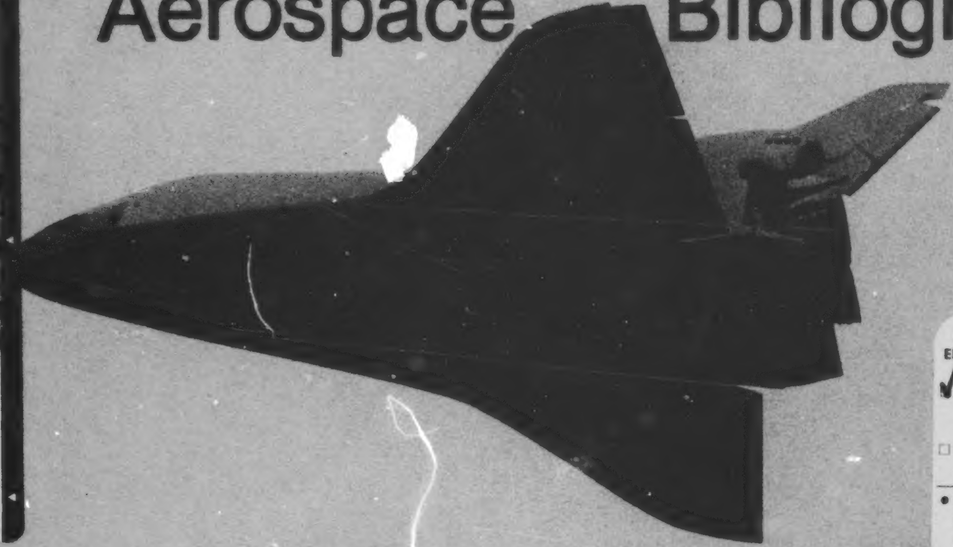

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Aerospace Bibliography

Seventh Edition

1982
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Introduction

The *Aerospace Bibliography*, Seventh Edition provides for teachers and the general adult reader an annotated and graded list of books and reference materials dealing with aerospace subjects.

The bibliography, first published in 1961, was one of NASA's early educational publications and one of its most welcome. Updated regularly until the Sixth Edition, which appeared in 1972, it provided a much needed teaching aid in assisting educators to locate and select the most recent aerospace literature and to plan and develop their classroom programs.

Continued interest and requests for the publication led to this new edition. Because it has been ten years since last published, and because aerospace literature includes numerous new areas of interest and investigation, this edition is limited to books and reference materials published during the period of 1971-80.

Jean F. Blashfield, who compiled the bibliography, is a science writer and a former writer-editor of the *NASA Report to Educators*.

NASA's Technical Monitor for the project was Muriel M. Thorne, Educational Programs Officer. It was coordinated by Dr. Frederick B. Tuttle, Special Assistant for Education to the Director of Academic Affairs.

National Aeronautics and Space Administration
Washington, D.C.

December 1981

Preface

It has been almost ten years since the Sixth Edition of the *Aerospace Bibliography* was published, ten years in which the themes of space have moved on from the sheer excitement of exploring beyond our atmosphere and of sending men to the Moon to the more reflective issues of understanding our universe, preparing for the future, and extending responsible dominion over near-space as a familiar place in which humans can work and even play. Astronomy, in topics once deemed esoteric, has become a subject of great public interest so that black holes are—or at least seem—as familiar as our Sun or the Milky Way. And the Space Shuttle seems clearly to be giving birth to a new generation of space exploration and utilization.

The *Aerospace Bibliography,* Seventh Edition, because of its almost ten-year coverage, includes only nonfiction books and pamphlets that need to be purchased from commercial or government sources. Fiction is excluded except in relation to commentaries on the relationship between science fiction and science fact. The free industrial materials and educational aids that are so useful in classrooms but tend to have a transitory availability are not included.

To find books on a particular subject and for a specific reading level, users of the Bibliography are advised to refer first to Part I—Subject Index. Many books appear in more than one category in the Index. Details about each item listed may then be found in Part II—Annotated Bibliography, or in Part III—Reference Books, if so noted.

The suggested reading or usage level of each item is designated by code letters as follows: (P) primary—grades 1-3; (I) intermediate—grades 4-6; (U) upper—grades 7-8; (S) secondary—grades 9-12; and (A) adult or college level. Most books that are of general interest to the public at the adult level are also listed for secondary unless they require a background more appropriate strictly to the adult level.

New to the Seventh Edition is the use of ISBNs—International Standard Book Numbers. For the first time, in a scheme that has been developing since about 1972, every book published is assigned its own number, a different number for each edition, whether it be hardcover, paperbound, or even library binding. Thus, most publishers are using the ISBNs as their ordering numbers to avoid confusion among editions. Take as an example, 0-671-33033-0. It looks complicated but is really quite straight-forward. The initial 0- means that the book is in the English language. The first group of numbers, 671-, indicates the publisher, in this case, Julian Messner. The second group, 33033-, indicates the paperbound edition of Cipriano's *America's Journeys into Space: The Astronauts of the United States.* If the hardcover edition were wanted, the number to be used would be 0-671-33020-9. The final single number is just a computer check code. Some of the earliest books included in this bibliography, as well as some of the smaller publications, do not have ISBNs.

For the most part, books listed in this bibliography bear copyright dates beginning in 1971 and extending through 1980. We recognize that some of the earlier books will be out of print; however, such books have been included here if their coverage is not out of date and they are likely to be found in a library. Because of the frequent changes book prices are now undergoing, prices have not been quoted in this edition.

The books appearing in this bibliography do not comprise a complete listing of all nontechnical books on the subjects of space and astronomy because of the occasional difficulty experienced in obtaining sample materials from publishers. Users are urged to consult *The Readers' Guide to Periodical Literature* or *Books in Print* to locate additional sources of information on space subjects.

Listing of a book in this bibliography should not be construed as an endorsement by the National Aeronautics and Space Administration or by the compiler. Orders for all books should be sent to the appropriate publisher, whose addresses are listed in the back.

Users of this bibliography are invited to send to NASA their suggestions for improvement in format, arrangement, or content for consideration in compiling future editions. Suggestions may be sent to the Education Services Branch (LCG-9), Academic Affairs Division, NASA, Washington, DC 20546.

The compiler acknowledges with thanks the assistance of representatives of the many publishers, industrial firms, professional associations, and government agencies whose cooperation in compiling this bibliography was solicited and most courteously extended.

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Part I

Subject Index

8

A. Space Exploration

The books in this section tell the story of human movement out into space, in terms both of the science involved and of the specific programs through which the work was done, especially in the United States. The planetary probes, applications satellites, and manned space programs that are covered in subsections are those that have been of major interest during the last decade or the Space Shuttle, which will be the basic space transportation system of coming years. Prior activities may be discussed as background in "General Information" or under "History."

1. General Information

Arno, Roger. *The Story of Space and Rockets.* 1978. (I & U)

Asimov, Isaac. *How Did We Find Out about Outer Space?* 1977. (I & U)

Bergaust, Erik. *Wernher von Braun.* 1976. (S & A)

Bluth, B. J., and S. R. McNeal, editors. *Update on Space,* Volume 1. 1980. (S & A)

Ciupik, Larry A., and James A. Seevers. *Space Machines.* 1979. (P)

Clarke, Arthur C. *The View from Serendip.* 1977. (S & A)

Cousins, Norman, et al. *Why Man Explores.* 1976. (U & up)

Deutsch, Keith. *Space Travel in Fact and Fiction.* 1980. (I & U)

DiCerto, Joseph H. *From Earth to Infinity: A Guide to Space Travel.* 1980. (U & up)

Fairley, Peter. *The A-Z of Space.* 1975. (U & S) (see Reference: Encyclopedias)

Feldman, Anthony. *Space.* 1980. (S & A)

Ferdman, Saul, editor. *The Second Fifteen Years in Space.* 1973. (A)

Freeman, Mae B. *Space Base.* 1972. (P & I)

Freeman, Michael. *Space Traveller's Handbook: Everyman's Comprehensive Manual to Space Flight.* 1979. (S & A)

Gallant, Roy A. *Man's Reach for the Stars.* 1971. (U)

Gardner, Robert. *Space: Frontier of the Future.* 1980. (U)

Gatland, Kenneth. *Rockets and Space Travel.* 1976. (P & I)

________. *The Young Scientist Book of Spaceflight.* 1978. (I)

Graphic House. *Color Your Way through Space at Kennedy Space Center.* (P & up)

Harrison, Harry, and Malcolm Edwards. *Spacecraft in Fact and Fiction.* 1979. (S & A)

Jones, Marvin. *Space Awareness.* (A)

Kerrod, Robin. *The Challenge of Space.* 1980. (I)

________. *The Universe.* 1976. (S & A)

Knight, David C., editor. *American Astronauts and Spacecraft: A Pictorial History from Project Mercury through the Skylab Manned Mission.* Revised edition. 1975. (U & S)

Knight, Dennis. *Space Flight.* Third edition. 1978. (I & U)

Levine, Arthur L. *The Future of the U.S. Space Program.* 1975. (A)

Lewis, Richard S. *From Vinland to Mars: A Thousand Years of Exploration.* 1978. (S & A)

Lovell, Bernard. *Man's Relation to the Universe.* 1975. (A)

Malone, Robert, and J. C. Suares. *Rocketship: An Incredible Voyage through Science Fiction and Science Fact.* 1977. (S & A)

McCall, Robert, and Isaac Asimov. *Our World in Space.* 1974. (S & A)

Moché, Dinah L. *The Star Wars Question and Answer Book about Space.* 1979. (I)

Mondey, David, editor. *The International Encyclopedia of Aviation.* 1977. (S & A)

Moore, Patrick A., and David Hardy. *The New Challenge of the Stars.* 1978. (I & U)

Newell, Homer E. *Beyond the Atmosphere: Early Years of Space Science.* 1980. (A)

Page, Thornton, and Lou Williams Page, editors. *Space Science and Astronomy: Escape from Earth.* 1976. (S & A)

Peterson, Robert W., editor. *Space: From Gemini to the Moon and Beyond.* 1972. (S & A) (see Reference: General)

Rutland, Jonathan. *Exploring the Planets.* 1978. (I)

Sagan, Carl. *Broca's Brain: Reflections on the Romance of Science.* 1979. (A)

Sarnoff, Jane, and Reynold Ruffins. *Space: A Fact and Riddle Book.* 1975. (P & I)

Schleicher, Robert. *The ETV Model Book.* 1979. (U & S)

Seevers, James A. *Space.* 1978. (P)

Service, Robert C., and John M. Williams. *Space Exploration.* Boy Scout Merit Badge Pamphlet #3354. 1976. (U & S)

Shenfeld, Gary. *Famous Firsts in Space.* 1972. (I & U)

Steinhoff, Ernst A., editor. *The Eagle Has Returned.* 1976 and 1977. (A)

Thompson, Brenda, and Rosemary Giesen. *Rockets and Astronauts.* 1977. (P)

Turnill, Reginald. *Space Age.* 1980. (I & U)

U.S. House of Representatives, Committee on Science and Technology. *Toward the Endless Frontier.* 1980. (S & A)

U.S. Library of Congress, Science Policy Research Division. *World-Wide Space Activities.* 1977. (A)

U.S. NASA. *New Horizons.* 1977. (U & up)

U.S. Naval Institute. *Space Atlas.* (S & A)

Von Braun, Wernher, and Frederick I. Ordway III. *History of Rocketry and Space Travel.* Revised edition. 1975. (U and up)

________. *New Worlds: Discoveries from Outer Space.* 1979.(S & A)

Wilding-White, T. M., editor. *Jane's Pocket Book of Space Exploration.* 1977. (General) (see Reference: General)

2. Space Travel

a. Principles of Spaceflight

Asimov, Isaac. *Asimov on Physics.* 1976. (S & A)

________. *Science Past—Science Future.* 1975. (S & A)

Beer, Tom. *The Aerospace Environment.* 1975. (A)

Bova, Ben. *The Fourth State of Matter: Plasma Dynamics and Tomorrow's Technology.* 1971. (U & S)

Branley, Franklyn M. *The Electromagnetic Spectrum: Key to the Universe.* 1979. (U & S)

________. *Experiments in the Principles of Space Travel.* Revised edition. 1973. (U & S)

________. *Weight and Weightlessness.* 1971. (P)

Brandt, John C., and Stephen P. Maran, editors. *New Astronomy and Space Science Reader.* 1977. (A)

Carpenter, Donald G., editor. *Environmental Space Sciences.* 1972. (A)

Center for Aerospace Education Development. *4 in 1 Aerospace Coloring Book.* (P)

Couper, Heather, and Nigel Henbest. *Space Frontiers.* 1978. (I & U)

DeNevi, Don. *To the Edges of the Universe: Space Exploration in the 20th Century.* 1978. (S & A)

George, Frank. *Science Fact.* 1978. (S & A)

Greenleaf, Peter. *Experiments in Space Science.* Revised edition. 1980. (U & S)

Harris, Susan. *Space.* 1979. (P)

Haymes, Robert C. *Introduction to Space Science.* 1971. (A)

Jespersen, James, and Jane Fitz-Randolph. *From Sundials to Atomic Clocks: Understanding Time and Frequency.* 1977. (U & up)

________. *Time and Clocks for the Space Age.* 1979. (U & S)

Lundquist, Charles A., editor. *Skylab's Astronomy and Space Sciences.* 1979. (S & A)

Page, Lou Williams, and Thornton Page. *Apollo-Soyuz Pamphlet No. 4: Gravitational Field.* 1977. (S & A)

________. *Apollo-Soyuz Pamphlet No. 9: General Science.* 1977. (S & A)

Pennsylvania Bureau of Curriculum Services. *Earth and Space Sciences: A Guide for Secondary Teachers.* 1973. (A)

Rickert, Russell K. *Astronomy and Space Exploration.* 1974. (A)

Rosenfeld, Sam. *Science Experiments for the Space Age.* 1972. (U & S)

Simon, Seymour. *Science at Work: Projects in Space Science.* 1971. (I & U)

Smith, Norman. *Space: What's Out There?* 1976. (P & I)

Solomon, Joan. *The Structure of Space: The Growth of Men's Ideas on the Nature of Forces, Fields and Waves.* 1974. (S & A)

Talcott Mountain Science Center. *Space Science Involvement.* 1974. (A)

U.S. NASA. *Skylab Experiments Vol. 1: Physical Science, Solar Astronomy.* 1973. (S)

________. *Skylab Experiments Vol. 5: Astronomy and Space Physics. 1973. (S)*

________. *Skylab Experiments Vol. 6: Mechanics.* 1973. (S)

Walker, Jearl. *The Flying Circus of Physics.* 1975. (S & A)

b. Propulsion

Baker, David. *The Rocket: The History and Development of Rocket and Missile Technology.* 1978. (S & A)

Bergaust, Erik. *Wernher von Braun.* 1976. (S & A)

Clark, John D. *Ignition! An Informal History of Liquid Rocket Propellants.* 1972. (S & A)

Edmonds, I. G. *Jet and Rocket Engines: How They Work.* Revised edition. 1973. (I & U)

Gatland, Kenneth. *Missiles and Rockets.* 1975. (U & S)

Green, Constance McLaughlin, and Milton Lomask. *Vanguard: A History.* 1971. (A)

Gunston, Bill. *The Illustrated Encyclopedia of the World's Rockets and Missiles.* 1979. (U & up) (see Reference: General)

Hendrickson, Walter B., Jr. *Who Really Invented the Rocket?* Revised edition. 1974. (I & U)

Lay, Bierne, Jr. *Earthbound Astronauts: The Builders of Apollo-Saturn.* 1971. (S & A)

Quackenbush, Robert. *The Boy Who Dreamed of Rockets.* 1978. (P & I)

Stoiko, Michael. *Pioneers of Rocketry.* 1974. (U & S)

Taylor, John W. R., and Michael J. H. Taylor. *Missiles of the World.* Revised edition. 1977. (S & A) (see Reference: General)

Von Braun, Wernher, and Frederick I. Ordway III. *The Rockets' Red Glare: An Illustrated History of Rocketry through the Ages.* 1976. (S & A)

(See also "Space Shuttle" and "Model Rocketry")

c. Interstellar Travel

Adelman, Saul J., and Benjamin Adelman. *Bound for the Stars.* 1980. (A)

Berman, Arthur I. *Space Flight.* 1979. (A)

Berry, Adrian. *The Iron Sun: Crossing the Universe through Black Holes.* 1977. (A)

Bova, Ben. *Starflight and Other Improbabilities.* 1973. (U & S)

Macvey, John W. *Interstellar Travel: Past, Present and Future.* 1977. (S & A)

Marder, L. *Time and the Space Traveller.* 1974. (A)

Nicolson, Iain. *The Road to the Stars.* 1978. (S & A)

3. Planetary Probes

a. General Information

Dwiggins, Don. *Robots in the Sky: Explorers of Our Solar System.* 1972. (I & U)

Gatland, Kenneth. *Robot Explorers.* 1972. (U & up)

Greeley, Ronald, and Michael H. Carr, editors. *A Geological Basis for the Exploration of the Planets.* 1976. (A)

Johnson, Nicholas L. *Handbook of Soviet Lunar and Planetary Exploration.* 1979. (A)

Powers, Robert M. *Planetary Encounters: The Future of Unmanned Spaceflight.* 1978. (S & A)

Strong, James. *Search the Solar System: The Role of Unmanned Interplanetary Probes.* 1973. (S & A)

U.S. NASA. *Galileo to Jupiter: Probing the Planet and Mapping Its Moons.* 1979. (S & A)

(See also "Astronomy in Space")

b. Mariner

Dunne, James A., and Eric Burgess. *The Voyage of Mariner 10: Mission to Venus and Mercury.* 1978. (S & A)

Murray, Bruce C., and Eric Burgess. *Flight to Mercury.* 1977. (S & A)

(NOTE: Mariners 11 and 12 were renamed Voyager 1 and 2; see below)

(See also "The Inner Planets")

c. Pioneer

Fimmel, Richard O., William Swindell, and Eric Burgess. *Pioneer Odyssey: Encounter with a Giant.* 1975. (S & A)

Fimmel, Richard O., James Van Allen, and Eric Burgess. *Pioneer: First to Jupiter, Saturn, and Beyond.* 1980. (S & A)

Jacobs, Lou, Jr. *By Jupiter: The Remarkable Journey of Pioneer 10.* 1975. (I & U)

U.S. NASA. *The Jupiter Pioneers.* 1974. (U & S)

________. *Pioneer Saturn Encounter.* 1979. (U & up)

(See also "The Outer Planets")

d. Viking to Mars

Asimov, Isaac. *Mars, the Red Planet.* 1977. (U & S)

Biemann, Hans-Peter. *The Vikings of '76.* 1977. (S & A)

Burgess, Eric. *To the Red Planet.* 1978. (S & A)

Cooper, Henry S. F., Jr. *The Search for Life on Mars.* 1980. (S & A)

Cousins, Norman, et al. *Why Man Explores.* 1976. (U & up)

French, Bevan M. *Mars: The Viking Discoveries.* 1977. (U & up)

Gemme, Leila Boyle. *The True Book of the Mars Landing.* 1977. (P & I)

Rovin, Jeff. *Mars!* 1978. (S & A)

U.S. NASA. *America on Mars.* 1976. (U & up)

________. *The Martian Landscape.* 1978. (S & A)

________. *Viking 1, Early Results.* 1976. (A)

________. *Viking Project: Mission to Mars—The Colors of Mars.* 1977. (S & A)

(See also "The Inner Planets")

e. Voyager to Jupiter and Saturn

Morrison, David, and Jane Samz. *Voyage to Jupiter.* 1980. (S & A)

Sagan, Carl, et al. *Murmurs of Earth: The Voyager Interstellar Records.* 1978. (S & A)

U.S. NASA. *Voyager—Journey to the Outer Planets.* 1977. (U & up)

________. *Voyager—Journey to the Outer Planets.* 1979. (U & up)

________. *Voyager: Mission to the Outer Planets.* 1977. (U & up)

________. *Voyager Encounters Jupiter.* 1979. (S & A)

________. *The Voyager Mission: Jupiter, the Giant of the Solar System.* 1979. (U & up)

________. *Voyager to Saturn.* 1980. (U & up)
(See also "The Outer Planets")

4. Applications Satellites

a. General Information

Fishlock, D., editor. *A Guide to Earth Satellites.* 1972. (S & A)

Miles, Howard, editor. *Artificial Satellite Observing and Its Applications.* 1974. (S & A)

Morgenthaler, George W., and Howard D. Greyber, editors. *Astronomy from a Space Platform.* 1972. (A)

Porter, Richard W. *The Versatile Satellite.* 1977. (A)

U.S. Department of Commerce, National Oceanographic and Atmospheric Administration. *Watch Upon a Star.* 1977. (U & up)

________. *Space: Environmental Vantage Point.* 1974. (S & A)

U.S. NASA. *Infrared Astronomical Satellite.* 1979. (S & A)

World Meteorological Organization. *One Hundred Years of Co-operation in Meteorology.* 1973. (A)

b. Communications

Chander, Romesh, and Kiran Karnik. *Planning for Satellite Broadcasting: The Indian Instructional Television Experiment.* 1976. (A)

Chayes, Abram, et al. *Satellite Broadcasting.* 1973. (A)

Clarke, Arthur C. *Voices Across the Sea.* Revised edition. 1975. (S & A)

Davidoff, Martin R. *Using Satellites in the Classroom: A Guide for Science Educators.* 1978. (A)

Galloway, Jonathan F. *The Politics and Technology of Satellite Communications.* 1972. (A)

Gilleo, Alma. *Communications from the Beginning.* 1977. (P)

Grayson, L. P., F. W. Norwood, and E. Wigren. *Man-Made Moons: Satellite Communications for Schools.* 1972. (A)

Hellman, Hal. *Communications in the World of the Future.* Revised edition. 1975. (U & S)

Howard, Sam. *Communications Machines.* 1980. (P)

Ingram, Dave. *OSCAR: The Ham Radio Satellite.* 1979. (S & A)

Jaffe, Leonard, editor. *Satellite Communications in the Next Decade.* 1977. (A)

Kildow, Judith Tegger. *Intelsat: Policy-Maker's Dilemma.* 1973. (A)

Kinsley, Michael E. *Outer Space and Inner Sanctums: Government, Business and Satellite Communications.* 1976. (S & A)

Kleinman, Joel P., editor. *Getting to Know OSCAR From the Ground Up.* 1977. (S & A)

Kohn, Bernice. *Communications Satellites: Message Centers in Space.* 1975. (I)

Leinwoll, Stanley. *From Spark to Satellite: A History of Radio Communication.* 1979. (S & A)

Maddox, Brenda. *Beyond Babel: New Directions in Communications.* 1972. (S & A)

Magnant, Robert S. *Domestic Satellite Policy: An FCC Giant Step.* 1977. (A)

Martin, James. *Communications Satellite Systems.* 1978. (S & A)

Pelton, Joseph N. *Global Communication Satellite Policy: INTELSAT, Politics and Functionalism.* 1974. (A)

Pelton, Joseph N., and Marcellus S. Snow, editors. *Economic and Policy Problems in Satellite Communications.* 1976. (A)

Polcyn, Kenneth A. *An Educator's Guide to Communications Satellite Technology.* 1973. (A)

Stewart, J. D. *VHF Radio Propagation.* 1978. (A)

Talcott Mountain Science Center. *Space Science Involvement.* 197[illegible]. (A)

UNESCO. *A Guide to Satellite Communications.* 1972. (A)

c. Remote Sensing

Barrett, E. C., and L. F. Curtis. *Introduction to Environmental Remote Sensing.* 1977. (A)

Boyer, Robert E. *How to Study the Earth from Space.* 1971. (A)

Brosius, Craig A., Janette C. Gervin, and James M. Ragusa. *Remote Sensing and the Earth.* 1977. (S & A)

Bryan, M. Leonard. *Remote Sensing of Earth Resources: A Guide to Information Sources.* 1979. (General) (see Reference: Bibliographies)

Darden, Lloyd. *The Earth in the Looking Glass.* 1974. (S & A)

Dickson, Paul. *Out of This World: American Space Photography.* 1977. (U & up)

Estes, John E., and Leslie W. Senger, editors. *Remote Sensing: Techniques for Environmental Analysis.* 1974. (A)

Holz, Robert K. *The Surveillant Science: Remote Sensing of the Environment.* 1973. (A)

Kroeck, Dick. *Everyone's Space Handbook: A Photo Imagery Source Manual.* 1976. (S & A) (see Reference: General)

Nixon, William D., and Richard E. McCormack. *Landsat: A Tool for Your Classroom.* 1978. (S & A)

Ordway, Frederick I., III. *Pictorial Guide to Planet Earth.* 1975. (S & A)

Petrillo, Anthony J. *What's the Use of Land?* 1977. (S)

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Bova, Ben. *Workshops in Space.* 1974. (I)

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Cobb, Vicki. *Super Suits.* 1975. (I)

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Engle, Eloise, and Arnold S. Lott. *Man in Flight: Biomedical Achievements in Aerospace.* 1979. (S & A)

Gatland, Kenneth. *Manned Spacecraft.* Revised edition. 1976. (S & A)

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________. *Skylab Experiments Vol. 7: Living and Working in Space.* 1973. (S)

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Worden, Alfred M. *I Want to Know about Flight to the Moon.* 1974. (I)

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b. Apollo Program

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Becklake, J. *Exploring: Man on the Moon.* 1977. (U & up)

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Cooke, Hereward Lester, with James D. Dean. *Eyewitness to Space.* 1971. (General)

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Hallion, Richard P., and Tom D. Crouch. *Ten Years Since Tranquillity: Reflections upon Apollo 11.* 1979. (S & A)

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Kondo, Herbert. *The Moon.* Revised edition. 1971. (U)

Langseth, Marcus and Lillian. *Apollo Moon Rocks.* 1972. (I)

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U.S. NASA. *Apollo.* 1974. (U & up)

________. *Apollo 16 at Descartes.* 1972. (U & up)

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c. Skylab

Belew, Leland F., editor. *Skylab, Our First Space Station.* 1977. (S & A)

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Coombs, Charles. *Skylab.* 1972. (I & U)

Cooper, Henry S. F., Jr. *A House in Space.* 1976. (S & A)

Cromie, William J. *Skylab: The Story of Man's First Station in Space.* 1976. (U & S)

Dwiggins, Don. *Into the Unknown: The Story of Space Shuttles and Space Stations.* 1971. (I & U)

Eddy, John A. *A New Sun: The Solar Results from Skylab.* 1979. (S & A)

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Summerlin, Lee B., editor. *Skylab, Classroom in the Sky.* 1977. (S & A)

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________. *Skylab EREP Investigations Summary.* 1978. (A)

________. *Skylab Experiments* (8 volumes). 1973. (S)

________. *Skylab Explores the Earth.* 1977. (S & A)

d. Apollo-Soyuz Test Project

El-Baz, Farouk, Astronaut Observations from the Apollo-Soyuz Mission. 1977. (S & A)

Ezell, Edward Clinton, and Linda Newman Ezell. *The Partnership: A History of the Apollo-Soyuz Test Project.* 1978. (S & A)

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e. Space Shuttle

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American Institute of Aeronautics and Astronautics. *Space Transportation Systems: 1980-2000.* 1979. (A)

Baker, David. *Space Shuttle.* 1979. (S & A)

Branley, Franklyn M. *Columbia and Beyond: The Story of the Space Shuttle.* 1979. (I & U)

Bursnall, W. J., et al., editors. *Space Shuttle Missions of the '80s.* 1977. (A)

Center for Aerospace Education Development. *Space Shuttle: A Single Concept Learning Packet.* (I & U)

________. *Space Shuttle: A Space Transportation System.* (I)

Chester, Michael. *Let's Go on a Space Shuttle.* 1976. (I)

Coombs, Charles. *Passage to Space: The Shuttle Transportation System.* 1979. (I)

Dooling, Dave, editor. *Shuttle to the Next Space Age.* 1979. (A)

Grey, Jerry. *Enterprise.* 1979. (S & A)

Kaplan, Marshall H. *Space Shuttle: America's Wings to the Future.* 1978. (S & A)

Morgenthaler, G. W., editor. *Space Shuttle and Spacelab Utilization: Near-term and Long-term Benefits for Mankind.* 1978. (A)

Morgenthaler, G. W., and William J. Bursnall, editors. *Space Shuttle Payloads.* 1973. (A)

Powers, Robert M. *Shuttle: The World's First Spaceship.* 1979. (S & A)

Priestley, Lee. *America's Space Shuttle.* 1978. (I)

Rector, William F., III, and Paul A. Penzo, editors. *Space Shuttle: Dawn of an Era.* 1980. (A)

Ross, Frank, Jr. *Space Shuttle: Its Story and How to Make a Flying Paper Model.* 1979. (I & U)

Space Science Board, National Research Council. *Scientific Uses of the Space Shuttle.* 1974. (A)

Steinberg, Florence S. *Aboard the Space Shuttle.* 1980. (U & up)

Stine, G. Harry. *Shuttle into Space: A Ride in America's Space Transportation System.* 1978. (I & U)

Talay, Theodore A. *Introduction to the Aerodynamics of Flight.* 1975. (S & A)

Taylor, L. B., Jr. *Space Shuttle.* 1979. (U & S)

Tross, Carl H., editor. *Future Space Activities.* 1976. (A)

U.S. NASA. *Space Shuttle* (wallsheet). 1979. (I & up)

________. *Space Shuttle* (booklet). 1977. (U & S)

Wagner, Richard. *Space Shuttles to Color, Cut Out and Fly.* 1979. (P, I & U)

B. Impacts of Space Exploration

The books covered in this section tend to be philosophical in nature, reflecting the pervasive quality of the influence of space exploration on our lives. Impacts on society, the law, and international politics are among the subjects covered. More specific in their references to space are the books in the subsection on spinoffs.

B. Impacts of Space Exploration

1. Impacts on Society

Brown, Seyom, et al. *Regimes for the Ocean, Outer Space, and Weather.* 1977. (A)

Calder, Nigel. *Spaceships of the Mind.* 1978. (S & A)

Cheston, T. Stephen, and David C. Webb, editors. *Space Humanization Series.* 1979. (A)

Davies, Merton E., and Bruce C. Murray. *The View from Space: Photographic Exploration of the Planets.* 1971. (A)

Ginzberg, Eli, et al. *Economic Impact of Large Public Programs: The NASA Experience.* 1976. (A)

Goldstein, Laurence. *The Moon Landing and Its Aftermath. The Michigan Quarterly Review.* 1979. (S & A)

Greve, Tim, Finn Lied, and Erik Tandberg, editors. *The Impact of Space Science on Mankind.* 1976. (S & A)

Heaps, Leo. *Operation Morning Light: Terror in Our Skies, The True Story of Cosmos 954.* 1978. (A)

Holman, Mary A. *The Political Economy of the Space Program.* 1974. (A)

James, Peter N. *Soviet Conquest from Space.* 1974. (S & A)

Johnson, Richard S., Albert Naumann, Jr., and Clay W. G. Fulcher, editors. *The Future United States Space Program.* 1979. (A)

Kloman, Erasmus H. *Unmanned Space Program Management: Surveyor and Lunar Orbiter.* 1972. (A)

Lovell, Bernard. *In the Center of Immensities.* 1978. (A)

________. *The Origins and International Economics of Space Exploration.* 1974. (A)

Maddox, Brenda. *Beyond Babel: New Directions in Communications.* 1972. (S & A)

National Research Council. *Science and Technology: A Five-Year Outlook.* 1979. (A)

Sagan, Carl. *The Cosmic Connection: An Extraterrestrial Perspective.* 1973. (S & A)

________. *Other Worlds.* 1975. (U & up)

Scott, John M. *Countdown to Encounter: Von Braun and the Astronauts.* 1979. (U & up)

Von Puttkamer, Jesco, and Thomas J. McCullough, editors. *Space for Mankind's Benefit.* 1972. (A)

2. Spinoffs

Allaway, Howard. *Lessons of the NASA Tech House.* 1980. (S & A)

Bova, Ben. *Workshops in Space.* 1974. (S & A)

Boyle, Charles P. *Space Among Us.* 1974. (S & A)

Colby, C. B. *Space Age Spinoffs: Space Program Benefits for All Mankind.* 1972. (I)

Fishlock, D., editor. *A Guide to Earth Satellites.* 1972. (S & A)

Gemme, Leila Boyle. *The True Book of Spinoffs from Space.* 1977. (P & I)

Grey, Jerry, Peter Downey, and Bruce Davis, editors. *Space: A Resource for Earth.* 1977. (A)

Gurney, Gene. *Space Technology Spinoffs.* 1979. (U & S)

Johnson, Francis S., editor. *International Congress on Space Benefits.* 1974. (A)

Ordway, Frederick I., III, Carsbie C. Adams, and Mitchell R. Sharpe. *Dividends from Space.* 1971. (S & A)

Paul, Gunter. *The Satellite Spin-off: The Achievements of Space Flight.* 1975. (S & A)

Taylor, L. B., Jr. *For All Mankind: America's Space Programs of the 1970s and Beyond.* 1974. (S & A)

________. *Gifts from Space: How Space Technology is Improving Life on Earth.* 1977. (U & S)

Tripp, Ralph H., and John K. Stotz, Jr., editors. *Space Technology Transfer to Community and Industry.* 1972. (A)

Tross, Carl H., editor. *Export of Aerospace Technology.* 1978. (A)

U.S. NASA. *NASA Tech House.* 1977. (S & A)

________. *New Horizons.* 1977. (U & up)

________. *Spinoff.* Annual. (S & A) (see Reference: Annuals)

3. International Cooperation and Law

Bhatt, S. *Legal Controls of Outer Space: Law, Freedom and Responsibility.* 1974. (A)

Blaine, J. C. D. *End of an Era in Space Exploration: From International Rivalry to International Cooperation.* 1976. (A)

Chayes, Abram, et al. *Satellite Broadcasting.* 1973. (A)

Cutler, Michael, editor. *International Cooperation in Space Operations and Exploration.* 1971. (A)

Harvey, Dodd L., and Linda C. Cicoritti. *U.S.-Soviet Cooperation in Space.* 1974. (A)

Hayes, William C., Jr., editor. *Space—New Opportunities for International Ventures.* 1980. (A)

Kildow, Judith Tegger. *Intelsat: Policy-Maker's Dilemma.* 1973. (A)

Levine, Arthur L. *The Future of the U.S. Space Program.* 1975. (A)

Robinson, George S. *Living in Outer Space.* 1976. (A)

Schwartz, Mortimer D., editor. *Space Law Perspectives.* 1976. (A)

Shaffer, Stephen M., and Lisa Robock Shaffer. *The Politics of International Cooperation: A Comparison of U.S. Experience in Space and in Security.* 1980. (A)

Smith, Delbert D. *Space Stations: International Law and Policy.* 1979. (A)

UNA-USA National Policy Panel. *Space Communications: Increasing UN Responsiveness to Mankind's Problems.* 1971. (A)

U.S. Library of Congress, Science Policy Research Division. *World-wide Space Activities.* 1977. (A)

White, Irvin L., et al. *Law and Politics in Outer Space: A Bibliography.* 1972. (A) (see Reference: Bibliographies)

4. Government and Politics

Harris, Gordon L. *Selling Uncle Sam.* 1976. (A)

Hirsch, Richard, and Joseph John Trento. *The National Aeronautics and Space Administration.* 1973. (S & A)

Lambright, W. Henry. *Governing Science and Technology.* 1976. (A)

Schauer, William H. *The Politics of Space: A Comparison of the Soviet and American Space Programs.* 1976. (A)

U.S. House of Representatives, Committee on Science and Technology. *Toward the Endless Frontier.* 1980. (S & A)

U.S. NASA. *Aeronautics and Space Report of the President.* Annual. (S & A) (see Reference: Annuals)

________. *This is NASA.* 1979. (U & up)

C. The Future

Looking into the future has become respectable, and a large part of the speculation revolves around the use we will put to space. In the general section below, speculation is far-ranging, while in the section on Future Space Activities, plans are more specific and involve both activities underway and those at least reasonably proposed for coming years.

C. The Future

1. A General Look

Abels, Harriette S. *Future Science.* 1980. (I)

________. *Future Travel.* 1980. (I)

Asimov, Isaac. *A Choice of Catastrophes.* 1979. (S & A)

________. *Science Past—Science Future.* 1975. (S & A)

Avery, Norman. *Time Out for Tomorrow.* 1977. (S & A)

Berry, Adrian. *The Iron Sun: Crossing the Universe through Black Holes.* 1977. (A)

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Bova, Ben. *The Seeds of Tomorrow.* 1977. (U & S)

Bova, Ben, editor. *The Analog Science Fact Reader.* 1974. (S & A)

Calder, Nigel. *Spaceships of the Mind.* 1978. (S & A)

Clarke, Arthur C. *Profiles of the Future: An Inquiry into the Limits of the Possible.* Revised edition. 1973. (S & A)

________. *Report on Planet Three and Other Speculations.* 1972. (S & A)

Cornish, Edward, editor. *1999: The World of Tomorrow.* 1978. (S & A)

Fowles, Jib, editor. *Handbook of Futures Research.* 1978. (A)

Gale, William A., editor. *Life in the Universe: The Ultimate Limits of Growth.* 1979. (A)

Gilfillan, Edward S., Jr. *Migration to the Stars: Never Again Enough People.* 1975. (S & A)

Murray, Bruce C. *Navigating the Future.* 1975. (S & A)

Rosen, Stephen. *Future Facts.* 1976. (S & A)

Sagan, Carl. *Broca's Brain: Reflections on the Romance of Science.* 1979. (A)

Verschuur, Gerrit L. *Cosmic Catastrophes.* 1978. (S & A)

2. Future Space Activities

Abels, Harriette S. *Future Space.* 1980. (I)

Adelman, Saul J., and Benjamin Adelman. *Bound for the Stars.* 1980. (A)

American Institute of Aeronautics and Astronautics. *Space Transportation Systems: 1980-2000.* 1979. (A)

Bergaust, Erik. *The Next 50 Years on the Moon.* Revised edition. 1974. (I & U)

Bluth, B. J., and S. R. McNeal, editors. *Update on Space, Volume I.* 1980. (S & A)

Bono, Philip, and Kenneth Gatland. *Frontiers of Space.* Revised edition. 1976. (S & A)

Couper, Heather, and Nigel Henbest. *Space Frontiers.* 1978. (I & U)

Ferdman, Saul, editor. *The Second Fifteen Years in Space.* 1973. (A)

Gardner, Robert. *Space: Frontiers of the Future.* 1980. (U)

Geis, Larry, and Fabrice Florin, editors. *Worlds Beyond: The Everlasting Frontier.* 1978. (A)

Hendrickson, Walter B., Jr. *Manned Spacecraft to Mars and Venus: How They Work.* 1975. (I & U)

Johnson, Richard S., Albert Naumann, Jr., and Clay W. G. Fulcher, editors. *The Future United States Space Program.* 1979. (A)

Kent, Stan, editor. *Remember the Future—The Apollo Legacy.* 1980. (S & A)

Moore, Patrick. *The Next Fifty Years in Space.* 1976. (S & A)

National Research Council. *Practical Applications of Space Systems.* 1975. (A)

Powers, Robert M. *Planetary Encounters: The Future of Unmanned Spaceflight.* 1978. (S & A)

Schneider, William C., editor. *Bicentennial Space Symposium: New Themes for Space.* 1977. (A)

Taylor, L. B., Jr. *For All Mankind: America's Space Programs of the 1970s and Beyond.* 1974. (S & A)

Tross, Carl H., editor. *Future Space Activities.* 1976. (A)

U.S. NASA. *A Forecast of Space Technology: 1980-2000.* 1976. (A)

________. *Outlook for Space.* 1976. (A)

a. Space Settlements

Averner, M. M., and R. D. MacElroy, editors. *On the Habitability of Mars: An Approach to Planetary Ecosynthesis.* 1976. (A)

Bergaust, Erik. *Colonizing Space.* 1978. (U & S)

________. *Colonizing the Planets: The Factual Story of Manned Interplanetary Flight into the 21st Century.* 1975. (I)

Billingham, John, William Gilbreath, and Brian O'Leary, editors. *Space Resources and Space Settlements.* 1979. (A)

Brand, Stewart, editor. *Space Colonies.* 1977. (S & A)

De Nevi, Don. *To the Edges of the Universe: Space Exploration in the 20th Century.* 1978. (S & A)

Dwiggins, Don. *Into the Unknown: The Story of Space Shuttles and Space Stations.* 1971. (I & U)

Gilfillan, Edward S., Jr. *Migration to the Stars: Never Again Enough People.* 1975. (S & A)

Glenn, Jerome Clayton, and George S. Robinson. *Space Trek: The Endless Migration.* 1978. (S & A)

Golden, Frederic. *Colonies in Space: The Next Giant Step.* 1977. (U & S)

Heppenheimer, T. A. *Colonies in Space.* 1977. (S & A)

________. *Toward Distant Suns.* 1979. (S & A)

Johnson, Richard D., and Charles Holbrow, editors. *Space Settlements: A Design Study.* 1977. (S & A)

Kerrod, Robin. *See Inside a Space Station.* 1978. (I)

Knight, David C. *Colonies in Orbit: The Coming Age of Human Settlements in Space.* 1977. (I)

Lunan, Duncan. *Interstellar Contact.* 1974. (S & A)

Marotta, Michael E. *Space Colonization: An Annotated Bibliography.* 1979. (General) (see Reference: Bibliographies)

Moché, Dinah L. *Life in Space.* 1979. (U & S)

Nicolson, Iain. *The Road to the Stars.* 1978. (S & A)

O'Neill, Gerard K. *The High Frontier: Human Colonies in Space.* 1977. (A)

Robinson, George S. *Living in Outer Space.* 1976. (A)

Tanner, Don, and George Johnson. *Cities in Space.* 1979. (S & A)

Woodward, Herbert N. *The Human Dilemma.* 1971. (A)

b. Space Industrialization

Branley, Franklyn M. *Columbia and Beyond: The Story of the Space Shuttle.* 1979. (I & U)

Cheston, T. Stephen, and David L. Winter, editors. *Human Factors of Outer Space Production.* 1980. (A)

Grey, Jerry, Peter Downey, and Bruce Davis, editors. *Space: A Resource for Earth.* 1977. (A)

Page, Lou Williams, and Thornton Page. *Apollo-Soyuz Pamphlet No. 8: Zero-G Technology.* 1977. (S & A)

Stine, G. Harry. *The Third Industrial Revolution.* 1975. (S & A)

U.S. NASA. *Skylab Experiments Vol. 3: Materials Science.* 1973. (S)

Van Patten, Richard A., Paul Siegler, and E. V. B. Stearns, editors. *The Industrialization of Space.* 1978. (A)

D. Astronomy

In 1980, with the Voyager 1 spacecraft, we learned more about Saturn in one week than in all of recorded history.

The activity of space exploration has broadened the science of astronomy, and in this section, what has been learned since 1957 is more significant than the space exploration procedures by which it was learned. All books included here do contain some material derived from the space program. The level of the material rarely goes above that which might be needed by a student in an introductory course in astronomy or an adult reader with a strong interest but no special education in the subject.

1. General Information and Textbooks

a. Introductory, Historical, and Multi-subject Books

Asimov, Issac. *Asimov on Astronomy*. 1974. (S & A)

________. *Asimov's Guide to Science*. Revised edition. 1972. (S & A)

________. *Quasar, Quasar, Burning Bright*. 1978. (S & A)

________. *The Road to Infinity*. 1979. (S & A)

________. *The Tragedy of the Moon*. 1973. (S & A)

Bendick, Jeanne. *The Big Strawberry Book of Astronomy*. 1979. (I)

Berger, Melvin. *Planets, Stars and Galaxies*. 1978. (I & U)

Blanchard, Paul A. *Atoms and Astronomy*. 1977. (S & A)

Boulton, John. *Basic Steps in Astronomy*. 1980. (S & A)

Brown, R. Hanbury. *Man and the Stars*. 1978. (S & A)

Ciupik, Larry A. *The Universe*. 1978. (P)

Corliss, William R. *Mysterious Universe: A Handbook of Astronomical Anomalies*. 1979. (A) (see Reference: General)

Degani, Meir H. *Astronomy Made Simple*. Revised edition. 1976. (S & A)

Engelbrekston, Sune. *Stars, Planets and Galaxies*. 1975. (U & S)

Feldman, Anthony. *Space*. 1980. (S & A)

Gammon, Richard G. *Chemistry Between the Stars*. 1977. (S & A)

George, Frank. *Science Fact*. 1978. (S & A)

Greenleaf, Peter. *Experiments in Space Science*. Revised edition. 1980. (U & S)

Jacobs, Kenneth Charles. *Extragalactic Astronomy: The Universe Beyond Our Galaxy*. 1976. (S & A)

Kaufmann, William J., III. *Galaxies and Quasars*. 1979. (A)

Maffei, Paolo. *Monsters in the Sky*. 1977. (A)

Mitton, Jacqueline. *Astronomy: An Introduction for the Amateur Astronomer*. 1978. (S & A)

Mitton, Jacqueline and Simon. *The Prentice-Hall Concise Book of Astronomy*. 1978. (U & up)

Mitton, Simon, editor. *The Cambridge Encyclopedia of Astronomy*. 1977. (S & A)

Moché, Dinah L. *Astronomy: A Self-Teaching Guide*. 1978. (S & A)

________. *The Star Wars Question and Answer Book about Space*. 1979. (I)

________. *What's Up There? Questions and Answers about Stars and Space*. 1976. (I)

Moore, Patrick. *Astronomy Facts and Feats*. 1979. (U & up) (see Reference: General)

________. *Can You Speak Venusian? A Guide to the Independent Thinkers*. 1972. (S & A)

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Slote, Alfred. *The Moon in Fact and Fancy.* Revised edition. 1971. (I)

Taylor, G. Jeffrey. *A Close Look at the Moon.* 1980. (I & U)

Wheat, Janis Knudsen. *Let's Go to the Moon.* 1977. (P)

Zim, Herbert S. *The New Moon.* 1980. (I)

(See also "Apollo Program")

4. Mars

Asimov, Isaac. *Mars, the Red Planet.* 1977. (U & S)

Averner, M. M., and R. D. MacElroy, editors. *On the Habitability of Mars: An Approach to Planetary Ecosynthesis.* 1976. (A)

Batson, R. M., P. M. Bridges, and J. L. Inge. *Atlas of Mars.* 1979. (S & A)

Bradbury, Ray, et al. *Mars and the Mind of Man.* 1973. (S & A)

Burgess, Eric. *To the Red Planet.* 1978. (S & A)

Chandler, David L. *Life on Mars.* 1979. (S & A)

Cooper, Henry S. F., Jr. *The Search for Life on Mars.* 1980. (S & A)

French, Bevan M. *Mars: The Viking Discoveries.* 1977. (U & up)

Knight, David C. *The First Book of Mars.* Revised edition. 1973. (I)

Moché, Dinah L. *Mars.* 1978. (P)

Moore, Patrick. *Guide to Mars.* 1977. (S & A)

Moore, Patrick, and Charles A. Cross. *Mars.* 1973. (S & A)

Mutch, Thomas A., et al. *The Geology of Mars.* 1976. (A)

Rovin, Jeff. *Mars!* 1978. (S & A)

U.S. NASA. *America on Mars.* 1977. (U & up)

________. *Images of Mars: the Viking Extended Mission.* 1980. (S & A)

________. *Mars as Viewed by Mariner 9.* 1974. (S & A)

________. *The Martian Landscape.* 1978. (S & A)

________. *Viking Orbiter Views of Mars.* 1980. (S & A)

________. *Viking Project: Mission to Mars—The Colors of Mars.* 1977. (S & A)

Washburn, Mark. *Mars at Last!* 1977. (S & A)

(See also "Mariner" and "Viking to Mars")

d. The Outer Planets

Bonestell, Chesley, and Arthur C. Clarke. *Beyond Jupiter: The Worlds of Tomorrow.* 1973. (S & A)

Fimmel, Richard O., James Van Allen, and Eric Burgess. *Pioneer: First to Jupiter, Saturn, and Beyond.* 1980. (S & A)

Hey, Nigel S. *How We Will Explore the Outer Planets.* 1973. (U & S)

Hoyt, William Grave. *Planets X and Pluto.* 1980. (A)

Nourse, Alan. *The Giant Planets.* 1974. (I & U)

(See also "Pioneer" and "Voyager to Jupiter and Saturn")

1. Jupiter

Asimov, Isaac. *Jupiter, the Largest Planet.* Revised edition. 1976. (U & S)

Fimmel, Richard O., William Swindell, and Eric Burgess. *Pioneer Odyssey: Encounter with a Giant.* 1975. (S & A)

Shurkin, Joel N. *Jupiter—The Star that Failed.* 1979. (I & U)

U.S. NASA. *Galileo to Jupiter: Probing the Planet and Mapping Its Moons.* 1979. (S & A)

________. *The Jupiter Pioneers.* 1974. (U & S)

________. *Voyager Encounters Jupiter.* 1979. (S & A)

________. *The Voyager Mission: Jupiter, The Giant of the Solar System.* 1979. (U & up)

Wetterer, Margaret. *The Moons of Jupiter.* 1971. (U & S)

2. Saturn and Beyond

American Geophysical Union. *Pioneer Saturn.* 1980. (A)

Asimov, Isaac. *Saturn and Beyond.* 1979. (U & S)

Tombaugh, Clyde, and Patrick Moore. *Out of the Darkness: The Planet Pluto.* 1980. (S & A)

U.S. NASA. *Pioneer Saturn Encounter.* 1979. (S & A)

________. *Voyager 1 Encounters Saturn.* 1980. (S & A)

________. *Voyager to Saturn.* 1980. (U & up)

e. Comets, Meteors, and Asteroids

Asimov, Isaac. *Comets and Meteors.* 1972. (P & I)

________. *How Did We Find Out about Comets?* 1975. (I & U)

Branley, Franklyn M. *Comets, Meteoroids and Asteroids: Mavericks of the Solar System.* 1974. (U & S)

Brown, Peter Lancaster. *Comets, Meteorites and Men.* 1974. (S & A)

Calder, Nigel. *The Comet is Coming: The Feverish Legacy of Mr. Halley.* 1980. (S & A)

Fodor, R. V. *Meteorites: Stones from the Sky.* 1976. (I)

Harvard-Smithsonian Center for Astrophysics. *Comets.* 1974. (S & A)

________. *Meteorites.* (S & A)

Knight, David C. *Tiny Planets: Asteroids of Our Solar System.* 1973. (I)

Moore, Patrick. *Comets: An Illustrated Introduction.* Revised edition. 1976. (S & A)

Nininger, Harvey H. *Find a Falling Star.* 1972. (S & A)

Nourse, Alan E. *The Asteroids.* 1975. (I & U)

E. Exobiology—Life Beyond Earth

The books included in this section are asking questions about the nature of life and the possibility of it occurring elsewhere in the universe; however, they do leave the question open.

Angrist, Stanley W. *Other Worlds, Other Beings.* 1973. (I & U)

Asimov, Isaac. *Alpha Centauri, the Nearest Star.* 1976. (U & S)

———. *Extraterrestrial Civilizations.* 1979. (S & A)

Aylesworth, Thomas G. *Who's Out There? The Search for Extraterrestrial Life.* 1975. (S)

Berendzen, Richard, editor. *Life Beyond Earth and the Mind of Man.* 1973. (S & A)

Bova, Ben. *Starflight and Other Improbabilities.* 1973. (U & S)

Bova, Ben, editor. *The Analog Science Fact Reader.* 1974. (S & A)

Bracewell, Ronald N. *The Galactic Club: Intelligent Life in Outer Space.* 1975. (A)

Chandler, David L. *Life on Mars.* 1979. (S & A)

Christian, James L., editor. *Extra-terrestrial Intelligence: The First Encounter.* 1976. (S & A)

Clarke, Arthur C. *Report on Planet Three and Other Speculations.* 1972. (S & A)

Cooper, Henry S. F., Jr. *The Search for Life on Mars.* 1980. (S & A)

Edelson, Edward. *Who Goes There? The Search for Intelligent Life in the Universe.* 1979. (A)

Engdahl, Sylvia L. *The Planet-Girded Suns: Man's View of Other Solar Systems.* 1974. (U & S)

Feinberg, Gerald, and Robert Schapiro. *Life Beyond Earth: The Intelligent Earthling's Guide to Extraterrestrial Life.* 1980. (A)

Gallant, Roy A. *Beyond Earth: The Search for Extraterrestrial Life.* 1977. (U & S)

Geis, Larry, and Fabrice Florin, editors. *Worlds Beyond: The Everlasting Frontier.* 1978. (A)

Goldsmith, Donald. *The Quest for Extraterrestrial Life: A Book of Readings.* 1980. (A)

Goldsmith, Donald, and Tobias Owen. *The Search for Life in the Universe.* 1980. (A)

Hoyle, Fred, and N. C. Wickramasinghe. *Diseases from Space.* 1979. (A)

———. *Lifecloud: The Origin of Life in the Universe.* 1979. (A)

Jonas, Doris and David. *Other Senses, Other Worlds.* 1976. (S & A)

Kraske, Robert. *Is There Life in Outer Space?* 1976. (I & U)

Lunan, Duncan. *Interstellar Contact.* 1974. (S & A)

Macvey, John W. *Interstellar Travel: Past, Present and Future.* 1977. (S & A)

———. *Whispers from Space.* 1973. (S & A)

Maruyama, Magoroh, and Arthur Harkins, editors. *Cultures Beyond the Earth: The Role of Anthropology in Outer Space.* 1975. (S & A)

Miller, George. *Life in the Universe: An Introduction to the Search for Extraterrestrial Intelligence.* (S & A)

Moché, Dinah L. *Life in Space.* 1979. (U & S)

———. *Search for Life Beyond Earth.* 1978. (U & S)

Morrison, Philip, John Billingham, and John Wolfe, editors. *The Search for Extraterrestrial Intelligence (SETI).* 1977. (A)

Ponnamperuma, Cyril, and A. G. W. Cameron, editors. *Interstellar Communication: Scientific Perspectives.* 1974. (A)

Ridpath, Ian. *Messages from the Stars.* 1978. (S & A)

———. *Worlds Beyond: A Report on the Search for Life in Space.* 1976. (U & S)

Sable, Martin H. *Exobiology: A Research Guide.* 1978. (A) (see Reference: Bibliographies)

Sagan, Carl. *Broca's Brain: Reflections on the Romance of Science.* 1979. (A)

———. *The Cosmic Connection: An Extraterrestrial Perspective.* 1973. (S & A)

———. *The Dragons of Eden: Speculations on the Evolution of Human Intelligence.* 1977. (S & A)

Sagan, Carl, et al. *Murmurs of Earth: The Voyager Interstellar Records.* 1978. (S & A)

Stilley, Frank. *The Search: Our Quest for Intelligent Life in Outer Space.* 1977. (U)

U.S. Library of Congress, Science Policy Research Division. *Possibility of Intelligent Life Elsewhere in the Universe.* Revised edition. 1977. (A)

Von Ditfurth, Hoimar. *Children of the Universe.* 1976. (S & A)

F. Aeronautics

NASA had its beginnings as the National Advisory Committee on Aeronautics, and aeronautical research has remained a prime activity. The books included in this section relate directly to research activities or to NACA/NASA's historical accomplishments. For a broader range of materials on aviation in general, see Books in Print.

F. Aeronautics

Abels, Harriette S. *Future Travel.* 1980. (I)

Anderton, David A. *NASA Aeronautics.* 1980. (S & A)

________. *Sixty Years of Aeronautical Research: 1917-1977.* 1978. (S & A)

Briggs, Gary O. *Move Over Jet—Here Comes Zep!* 1977. (S & A)

Dean, Anabel. *Up, Up, and Away! The Story of Ballooning.* 1980. (I & U)

Emme, Eugene M., editor. *Two Hundred Years of Flight in America: A Bicentennial Survey.* 1977. (A)

Friedlander, Mark P., Jr., and Gene Gurney. *Higher, Faster and Farther.* 1973. (S & A) (see Reference: General)

Hallion, Richard P. *Supersonic Flight: Breaking the Sound Barrier and Beyond.* 1972. (S & A)

Hellman, Hal. *Transportation in the World of the Future.* Revised edition. 1974. (U & S)

Lucas, John. *The Big Umbrella.* 1973. (S & A)

Mondey, David, editor. *The International Encyclopedia of Aviation.* 1977. (S & A) (see Reference: Encyclopedias)

Navarra, John Gabriel. *Superplanes.* 1979. (U)

Talay, Theodore A. *Introduction to the Aerodynamics of Flight.* 1975. (S & A)

Taylor, John W. R., compiler. *Jane's Pocket Book of Research and Experimental Aircraft.* 1977. (S & A) (see Reference: General)

U.S. NASA. *Aircraft Energy Efficiency, Overview.* 1980. (S & A)

________. *Progress in Aircraft Design since 1903.* 1974. (U & up)

White, William J. *Airships for the Future.* Revised edition. 1978. (S & A)

G. Energy

Because of NASA's proven capability in the management of major scientific programs, it has undertaken a role in energy research involving solar and wind energy. For a broader range of materials on energy in general, see Books in Print.

G. Energy

1. General Information

Ackins, Ralph. *Energy Machines.* 1980. (P)

Allaway, Howard. *Lessons of the NASA Tech House.* 1980. (S & A)

Asimov, Isaac. *How Did We Find Out about Energy?* 1975. (I & U)

Branley, Franklyn M. *Energy for the 21st Century.* 1975. (I & U)

Fowler, John M. *Energy-Environmental Source Book.* 1975. (A)

Hellman, Hal. *Energy in the World of the Future.* 1973. (U & S)

Kiefer, Irene. *Energy for America.* 1979. (I & U)

Meador, Roy. *Future Energy Alternatives.* 1978. (S & A)

Posthuma, Fredrick E., editor. *Energy and Education: Teaching Alternatives.* 1978. (A)

U.S. NASA. *Energy and Technology Applications.* 1979. (S & A)

________. *NASA and Energy.* 1976. (U & up)

________. *NASA Tech House.* 1977. (S & A)

Woodburn, John H. *Energy.* Boy Scout Merit Badge Pamphlet #3335. 1978. (U & S)

2. Solar Energy

Adams, Florence. *Catch a Sunbeam: A Book of Solar Study and Experiments.* 1978. (I & U)

Augustyn, James. *The Solar Cat Book.* 1979. (U & up)

Baer, Steve. *Sunspots: An Exploration of Solar Energy through Fact and Fiction.* 1979. (S & A)

Behrman, Daniel. *Solar Energy: The Awakening Science.* 1976. (A)

Bendick, Jeanne. *Putting the Sun to Work.* 1979. (P)

Bergaust, Erik. *Colonizing Space.* 1978. (U & S)

Berger, Melvin. *Energy from the Sun.* 1976. (P)

Branley, Franklyn M. *Solar Energy.* Revised edition. 1975. (I & U)

Buckley, Shawn. *Sun Up to Sun Down: Understanding Solar Energy.* 1979. (S & A)

Cheremisinoff, Paul N., and Thomas C. Regino. *Principles and Applications of Solar Energy*. 1978. (A)

Gadler, Steve J., and Wendy Wriston Adamson. *Sun Power: Facts about Solar Energy*. 1978. (U)

Halacy, D. S., Jr. *The Coming Age of Solar Energy*. Revised edition. 1973. (U & S)

________. *Experiments with Solar Energy*. 1975. (U)

Hickok, Floyd. *Handbook of Solar and Wind Energy*. 1975. (A)

Hoke, John. *Solar Energy*. Revised edition. 1978. (U & S)

Institute of Environmental Sciences. *Solar Energy and Its Uses*. 1976. (U & up)

Knight, David C. *Harnessing the Sun: The Story of Solar Energy*. 1976. (I & U)

Kraft, Christopher C., Jr. *The Solar Power Satellite Concept: The Past Decade and the Next Decade*. 1979. (U & up)

McDaniels, David K. *The Sun, Our Future Energy Source*. 1979. (A)

Metos, Thomas H., and Gary G. Bitter. *Exploring with Solar Energy*. 1978. (I)

NSF/NASA Solar Energy Panel. *An Assessment of Solar Energy as a National Energy Resource*. 1972. (A)

Reed, Millard. *Solar Energy for Tomorrow's World*. 1980. (U & S)

Smith, Norman F. *Sun Power*. 1976. (P)

Turner, Rufus P. *Solar Cells and Photocells*. 1975. (S & A)

U.S. Community Services Administration. *Solar Energy Policy*. 1979. (S & A)

U.S. Department of Energy. *Fuels and Chemicals Made from Solar Energy: Options for the 1990's and Beyond*. 1980. (A)

U.S. Energy Research and Development Administration. *Usable Electricity from the Sun*. 1980. (S & A)

Williams, J. Richard. *Solar Energy: Technology and Applications*. Revised edition. 1977. (A)

Williams, Robert H., editor. *Toward a Solar Civilization*. 1978. (A)

(See also "The Sun")

3. Wind Energy

Brown, Joseph E., and Anne Ensign Brown. *Harness the Wind: The Story of Windmills*. 1977. (I & U)

Cheremisinoff, Nicholas P. *Fundamentals of Wind Energy*. 1978. (S & A)

Dennis, Landt. *Catch the Wind: A Book of Windmills and Windpower*. 1976. (I & U)

Eldridge, Frank R. *Wind Machines*. 1975. (A)

Hickok, Floyd. *Handbook of Solar and Wind Energy*. 1975. (A)

U.S. Department of Agriculture, Science and Education Administration. *Wind and Windmills*. 1980. (S & A)

H. Space and the Humanities

The impacts of space on our society are not limited to those in science, politics, or the economy. Space exploration has become a subject of history and an important image in the arts of our age.

H. Space and the Humanities

1. History

Allen, Jon L. *Aviation and Space Museums of America.* 1975. (General) (see Reference: General)

Anderton, David A. *Sixty Years of Aeronautical Research: 1917-1977.* 1978. (S & A)

Bainbridge, William Sims. *The Spaceflight Revolution: A Sociological Study.* 1976. (A)

Blaine, J. C. D. *End of an Era in Space Exploration: From International Rivalry to International Cooperation.* 1976. (A)

Bruno, Leonard C. *We Have a Sporting Chance: The Decision to Go to the Moon.* 1979. (S & A)

Bryan, C. D. B. *The National Air and Space Museum.* 1979. (U & up)

Daniloff, Nicholas. *The Kremlin and the Cosmos.* 1972. (A)

Durant, Frederick C., III, and George S. James, editors. *First Steps into Space.* 1974. (A)

Emme, Eugene M., editor. *Twenty-five Years of the American Astronautical Society: Historical Reflections and Projections, 1954-1979.* 1980. (A)

Friedlander, Mark P., Jr., and Gene Gurney. *Higher, Faster and Farther.* 1973. (S & A) (see Reference: General)

Gallant, Roy A. *Man's Reach for the Stars.* 1971. (U)

Ginzberg, Eli, et al. *Economic Impact of Large Public Programs: The NASA Experience.* 1976. (A)

Green, Constance McLaughlin, and Milton Lomask. *Vanguard: A History.* 1971. (A)

Gurney, Gene and Clare. *Cosmonauts in Orbit: The Story of the Soviet Manned Space Program.* 1972, updated 1974. (U & S)

________. *The Launching of Sputnik, October 4, 1957: The Space Age Begins.* 1975. (U & S)

Hall, R. Cargill, editor. *Essays on the History of Rocketry and Astronautics.* 1977. (A)

Hallion, Richard P. *Legacy of Flight: The Guggenheim Contribution to American Aviation.* 1977. (A)

________. *Supersonic Flight: Breaking the Sound Barrier and Beyond.* 1972. (S & A)

Killian, James R., Jr. *Sputnik, Scientists, and Eisenhower.* 1977. (A)

Lasby, Clarence G. *Project Paperclip: German Scientists and the Cold War.* 1971. (S & A)

Murphy, Lynne C. *Rockets, Missiles, and Spacecraft of the National Air and Space Museum.* 1976. (S & A) (see Reference: General)

Newell, Homer E. *Beyond the Atmosphere: Early Years of Space Science.* 1980. (A)

Ordway, Frederick I., III, and Mitchell R. Sharpe. *The Rocket Team.* 1979. (S & A)

Peterson, Robert W., editor. *Space: From Gemini to the Moon and Beyond.* 1972. (S & A) (see Reference: General)

Riabchikov, Evgeny. *Russians in Space.* 1971. (S & A)

Scott, John M. *Countdown to Encounter: Von Braun and the Astronauts.* 1979. (U & up)

Smolders, Peter. *Soviets in Space.* 1974. (S & A)

Steinhoff, Ernst A., editor. *The Eagle has Returned.* 1976 and 1977. (A)

Turnill, Reginald. *The Observer's Spaceflight Directory.* 1978. (General) (see Reference: General)

Vladimirov, Leonid. *The Russian Space Bluff: The Inside Story of the Russian Drive to the Moon.* 1973. (A)

Wells, Helen H., Susan H. Whiteley, and Carrie E. Karegeannes. *Origins of NASA Names.* 1976. (S & A) (see Reference: General)

2. Biography

Aldrin, Col. Edwin E. "Buzz", Jr., with Wayne Varga. *Return to Earth.* 1973. (S & A)

Bergaust, Erik. *Wernher von Braun.* 1976. (S & A)

Brower, Kenneth. *The Starship and the Canoe.* 1978. (S & A)

Center for Aerospace Education. *Dr. Robert H. Goddard: A Single Concept Learning Packet.* (I & U)

Cipriano, Anthony J. *America's Journeys into Space: The Astronauts of the United States.* 1979. (U & up)

Clayton, Donald D. *The Dark Night Sky: A Personal Adventure in Cosmology.* 1975. (S & A)

Collins, Michael. *Carrying the Fire: An Astronaut's Journeys.* 1974. (S & A)

________. *Flying to the Moon and Other Strange Places.* 1976. (I & U)

Cunningham, Walter. *The All-American Boys.* 1977. (S & A)

Dyson, Freeman. *Disturbing the Universe.* 1979. (A)

Educational Research Council of America. *Explorers and Discoverers: John Glenn.* 1975. (P)

Grissom, Betty, and Henry S. Still. *Starfall.* 1974. (S & A)

Irwin, James B., with William W. Emerson, Jr. *To Rule the Night: The Discovery Voyage of Astronaut Jim Irwin.* 1973. (S & A)

Irwin, Mary, with Madaline Harris. *The Moon in Not Enough: An Astronaut's Wife Finds Peace With God and Herself.* 1978. (S & A)

Kraus, John. *Big Ear.* 1976. (U & up)

Lerner, Aaron B. *Einstein and Newton, A Comparison of the Two Greatest Scientists.* 1973. (S & A)

Lomask, Milton. *Robert H. Goddard: Space Pioneer.* 1972. (P & I)

Nininger, Harvey H. *Find a Falling Star.* 1972. (S & A)

Oliver, Carl R., compiler. *Plane Talk: Aviators' and Astronauts' Own Stories.* 1980. (U & up)

Quackenbush, Robert. *The Boy Who Dreamed of Rockets.* 1978. (P & I)

Segel, Thomas D. *Men in Space.* 1975. (U & up) (see Reference: General)

Stoiko, Michael. *Pioneers of Rocketry.* 1974. (U & S)

Westman, Paul. *Alan Shepard: First American in Space.* 1980. (P & I)

________. *John Glenn: Around the World in 90 Minutes.* 1980. (P & I)

________. *Neil Armstrong: Space Pioneer.* 1980. (I)

Wolfe, Tom. *The Right Stuff.* 1979. (S & A)

3. Literature

a. Space Poetry

Ackerman, Diane. *The Planets: A Cosmic Pastoral.* 1976. (S & A)

Roberts, Burgert. *Spacewalks: Poems for the Moon Age.* 1971. (General)

Sagan, Carl. *Other Worlds.* 1975. (U & up)

Worden, Alfred M. *Hello Earth: Greetings from Endeavor.* 1974. (U & up)

b. Commentary on Science Fiction

Asimov, Isaac, Martin Harry Greenberg, and Charles G. Waugh, editors. *The Science Fictional Solar System.* 1979. (S & A)

Barron, Neil, editor. *Anatomy of Wonder: Science Fiction.* 1976. (General) (see Reference: Bibliographies)

Bova, Ben. *Through Eyes of Wonder: Science Fiction and Science.* 1975. (U & S)

Bradbury, Ray, et al. *Mars and the Mind of Man.* 1973. (S & A)

Deutsch, Keith. *Space Travel in Fact and Fiction.* 1980. (I & U)

Harrison, Harry, and Malcolm Edwards. *Spacecraft in Fact and Fiction.* 1979. (S & A)

Jonas, Doris and David. *Other Senses, Other Worlds.* 1976. (S & A)

Malone, Robert, and J. C. Suares. *Rocketship: An Incredible Journey through Science Fiction and Science Fact.* 1977. (S & A)

Moore, Patrick A., and David Hardy. *The New Challenge of the Stars.* 1978. (I & U)

Suares, Jean-Claude, and Richard Siegel. *Fantastic Planets.* 1979. (I, U & S)

4. The Visual Arts

a. Space Art

Ames, Lee J. *Draw 50 Airplanes, Aircraft and Spacecraft.* 1977. (General)

Bonestell, Chesley, and Arthur C. Clarke. *Beyond Jupiter: The Worlds of Tomorrow.* 1973. (S & A)

Cooke, Hereward Lester, with James D. Dean. *Eyewitness to Space.* 1971. (General)

McCall, Robert, and Isaac Asimov. *Our World in Space.* 1974. (S & A)

Miller, Ron, compiler. *Space Art.* 1978. (I & up)

________. *The Space Art Poster Book.* 1978. (I & up)

Ross, Dave. *Making Space Puppets.* 1980. (I)

Ryan, Peter, and Ludek Pesek. *Solar System.* 1978. (S & A)

b. Space Photography

Alter, Dinsmore, Clarence H. Cleminshaw, and John G. Phillips. *Pictorial Astronomy.* Fourth edition. 1974. (S & A)

Arnold, H. J. P. *Images from Space.* 1979. (General)

Bodechtel, Johann, and Hans-Gunter Gieroff-Emden. *The Earth from Space.* 1974. (S & A)

Davies, Merton E., and Bruce C. Murray. *The View from Space: Photographic Exploration of the Planets.* 1971. (A)

Dickson, Paul. *Out of This World: American Space Photography.* 1977. (U & up)

Ferris, Timothy. *Galaxies.* 1980. (S & A)

Hapgood, Fred. *Space Shots: An Album of the Universe.* 1979. (S & A)

Lowman, Paul D., Jr. *The Third Planet: Terrestrial Geology in Orbital Photographs.* 1972. (S & A)

Paul, H. E. *Outer Space Photography for the Amateur.* Fourth edition. 1976. (S & A)

I. Aerospace Education

The books included in this section provide educators and group leaders at all levels with curricular material and activity guides. They include straightforward aerospace textbooks for the secondary level, games for the primary ages, as well as ideas for science, mathematics, the arts and humanities, and physical education. The subsection on model rocketry provides both hobbyists and educators with guidance in this safe and challenging motivator and hobby. In the final subsection the role of NASA in direct educational activities is described.

I. Aerospace Education

1. Textbooks, Teachers' Guides, and Resource Materials

(NOTE: Astronomy textbooks are listed under "Astronomy")

Blanchard, Paul A. *Atoms and Astronomy.* 1977. (S & A)

Boyer, Robert E. *How to Study the Earth from Space.* 1971. (A)

Brosius, Craig A., Janette G. Gervin, and James M. Ragusa. *Remote Sensing and the Earth.* 1977. (S & A)

Center for Aerospace Education Development. *Aerospace: The Challenge.* 1979. (S)

________. *4 in 1 Aerospace Coloring Books: Book 1 and Book 2.* (P)

________. *Single-Concept Learning Packets: Space Shuttle, Dr. Robert H. Goddard.* (I & U)

________. *Space Shuttle: A Space Transportation System.* (I)

Center for War/Peace Studies. *Teaching about Spaceship Earth.* 1972. (A)

Davidoff, Martin R. *Using Satellites in the Classroom: A Guide for Science Educators.* 1978. (A)

Gammon, Richard H. *Chemistry between the Stars.* 1977. (S & A)

Hankins, Donna B. *A Practical Guide to the Use of Space and Aerial Photography in the Elementary and Secondary School Classroom.* 1976. (A)

Hanson, George, and John Horstman. *Global Games Resources Manual.* 1977. (S & A)

Jacobs, Kenneth Charles. *Extragalactic Astronomy: The Universe beyond our Galaxy.* 1977. (S & A)

Jones, Marvin. *Space Awareness.* (A)

Kopp, O. W., et al. *Elementary School Aerospace Activities: A Resource for Teachers.* 1977. (A)

Martin, Elizabeth F., editor. *Aerospace Activities for Learning and Fun.* (P & I)

Matson, Wayne R., editor. *The Book of Aerospace Education.* 1978. (A)

Matson, Wayne R., and Julie Bettenberg, editors. *Directory of Aviation and Space Education.* Third edition. 1980. (General) (see Reference: Bibliographies)

Matthews, William H., II, compiler. *Helping Children Learn Earth-Space Science.* 1971. (A)

Maupin, Pauline H. *Aerospace Education: Games and Activities for the Elementary School.* 1975. (P & I)

Misenhimer, Ted G. *Aeroscience.* Third edition. 1976. (S)

Moncure, Jane Belk. *Skip Aboard a Space Ship.* 1978. (P & I)

Nixon, William D., and Richard E. McCormack. *Landsat: A Tool for Your Classroom.* 1978. (A)

Page, Lou Williams, and Thornton Page. *Apollo-Soyuz Pamphlets Nos. 1-9.* 1977. (S & A)

Pennsylvania Bureau of Curriculum Services. *Earth and Space Science: A Guide for Secondary Teachers.* 1973. (A)

Petrillo, Anthony J. *What's the Use of Land?* 1977. (S)

Sanderson. *Aviation/Aerospace Fundamentals.* Fourth edition. 1977. (S)

Straka, W. C. *The Supernova.* 1977. (S & A)

Summerlin, Lee B., editor. *Skylab, Classroom in Space.* 1977. (S & A)

Talcott Mountain Science Center. *Space Science Involvement.* 1974. (A)

U.S. NASA. *The World of Tomorrow.* 1978. (A)

Utgard, Russell, et al. *Sourcebook for Earth Sciences and Astronomy.* 1972. (A)

2. Model Rocketry

Barrowman, Jim. *Calculating the Center-of-Pressure of a Model Rocket.* Revised edition. 1975. (U & S)

________. *Stability of a Model Rocket in Flight.* Revised edition. 1975. (U & S)

Boyd, Grant. *Model Rocket Design Manual.* Second edition. 1975. (U & S)

________. *Rocketry Exploration: Power-System Handbook.* 1977. (I & up)

Cannon, Robert L. *The Laws of Motion and Model Rocketry.* 1972. (I & U)

________. *A Learning Guide for Model Rocket Launch Systems.* Revised edition. 1976. (I & up)

________. *Projects in Model Rocketry.* 1974. (I & up)

Edmonson, Harold A., editor. *Famous Spaceships of Fact and Fantasy. . . and How to Model Them.* 1979. (I & up)

Estes Industries. *The Alpha Book of Model Rocketry.* Revised edition. 1976. (U & S)

Freed, Richard E. *Camp Leader's Model Rocketry Manual.* Revised edition. 1976. (A)

Lowry, Peter, and Field Griffith. *Model Rocketry: Hobby of Tomorrow.* 1972. (U & S)

Malewieki, Douglas. *Model Rocket Altitude Performance.* (U & S)

Mandell, Gordon K., George J. Caporaso, and William P. Bengen. *Topics in Advanced Model Rocketry.* 1973. (A)

Matson, Wayne R. *Educators Guide to Model Rocketry.* Revised edition. 1975. (S & A)

Olney, Ross R. *Out to Launch: Model Rockets.* 1979. (I & U)

Safford, Edward L., Jr. *Advanced Radio Control including Rockets and Robots.* Second edition. 1980. (S & A)

Saltrick, Daniel F., Alfred M. Kabota, and Robert L. Cannon. *Aerospace Education and Model Rocketry.* Second edition. 1975. (S & A)

Schleicher, Robert. *The ETV Model Book.* 1979. (U & S)

Smith, Harry T., and Henry J. Warden. *Industrial Arts Teachers Manual for Model Rocketry.* 1980. (A)

Stine, G. Harry. *Handbook of Model Rocketry.* Fourth edition. 1976. (I & up)

________. *The New Model Rocketry Manual.* 1977. (S)

3. NASA Educational Services

NASA's educational programs serve the teacher, the student, the school, and the community. Information about the programs and services, including lists of *NASA Publications* and *NASA Films*, is available from the Educational Services Office at the NASA Centers that serve specific geographic areas. Special resource centers, which make professional curriculum materials available to teachers, have been established at most of the NASA Centers. Where to write for services:

NASA Ames Research Center
Moffett Field, California 94035
Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

NASA Goddard Space Flight Center
Greenbelt, Maryland 20771
Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

NASA Lyndon B. Johnson Space Center
Houston, Texas 77058
Colorado, Kansas, Nebraska, New Mexico, N. Dakota, Oklahoma, S. Dakota, Texas

NASA John F. Kennedy Space Center
Kennedy Space Center, Florida 32899
Florida, Georgia, Puerto Rico, Virgin Islands

NASA Langley Research Center
Hampton, Virginia 23665
Kentucky, N. Carolina, S. Carolina, Virginia, West Virginia

NASA Lewis Research Center
21000 Brookpark Road, Cleveland, Ohio 44135
Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

NASA George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812
Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, Tennessee

Part II

Annotated Bibliography

A

Abell, George O. *Drama of the Universe*. Holt, Rinehart, 1978. LC# 77-22338. ISBN 9-03-022401-2. 528pp. Color and b/w photos, diagrams. Index. Glossary. Bibliography. Adult.

A textbook for nonscience majors, which, the author says, has been cast "in the format of a play, with six acts, a prologue and an epilogue, and some scenes." The acts are: 1) Order, Not Chaos; 2) Light, Space and Time; 3) The Depths of Space; 4) The Birth, Life, and Death of a Star; 5) The Search for Life; and 6) The Grand Questions. Much of the data of astronomy is located in a large appendix, which ends with a collection of star maps. Dotted throughout the textual material are thought-provoking questions and student activities.

________. *Exploration of the Universe*. Third edition. Holt, Rinehart, 1975. LC# 74-20790. ISBN 0-03-089665-7. 738pp. Color and b/w photos, diagrams. Index. Glossary. Bibliography. Instructor's Manual available: ISBN 0-03-089666-5. Adult.

A classic textbook for the general university student, revised to include new information on the planets, discoveries of the Apollo program, and recent thinking on stellar evolution and the possibilities of life in the universe. It is more complete than many of the general textbooks and can readily be used by science majors whose reading will include the technical mathematical material set in smaller type. Each chapter ends with relevant exercises. Star charts are bound in the back.

Abels, Harriette S. *Future Science*. Our Future World series. Crestwood House, 1980. LC# 80-19412. Library binding ISBN 0-89686-089-2. Paperbound ISBN 0-89686-080-9. 48pp. Color and b/w photos and art. Glossary. Intermediate.

A futurist's look at science to come, discussing and illustrating innovations related to meteorology, automation, and space travel that may play a role in our lives.

________. *Future Space*. Our Future World series. Crestwood House, 1980. LC# 80-16457. Library binding ISBN 0-89686-087-6. Paperbound ISBN 0-89686-095-6. 48pp. Color and b/w art. Glossary. Intermediate.

Wheel-shaped colonies located in space at L-5, construction from lunar materials, cylindrical colonies of one hundred thousand inhabitants, mining the asteroids, factories in space, even vacations in orbit—these are among the realistic predictions of futurists about the way we will use space in coming years.

________. *Future Travel*. Our Future World series. Crestwood House, 1980. LC# 80-16460. Library binding ISBN 0-89686-088-4. Paperbound ISBN 0-89686-097-3. 48pp. Color art, b/w photos. Glossary. Intermediate.

Likely means of travel in the future include electric cars, double-decker airplanes, people movers for mass transit, personal flying cars, and pleasurable space travel to other planets. Some of the vehicles projected are already being investigated by NASA and the aerospace industry.

Ackerman, Diane. *The Planets: A Cosmic Pastoral*. Morrow, 1976. LC# 76-14840. Hardcover ISBN 0-688-03088-2. Paperbound ISBN 0-688-08088-X. 160pp. B/w photos and drawings. Glossary. Secondary and adult.

"Knee-deep in the cosmic overwhelm, I'm stricken by the ricochet wonder of it all." Thus begins a poet's look at our solar system, using scientific accuracy in the confines of poetic structure. The poems are enhanced by photos of the planets.

Ackins, Ralph. *Energy Machines*. Raintree, 1980. LC# 79-27714. ISBN 0-8172-1336-8. 32pp. Color photos. Index. Glossary. Primary.

The energy machines are the devices that put fuels into usable form for people—mining equipment, oil rigs, solar energy collectors, windmills, and more. Each is presented in a large picture with brief text.

Adams, Florence. *Catch a Sunbeam: A Book of Solar Study and Experiments*. Harcourt, Brace, 1978. LC# 78-52820. ISBN 0-15-215197-4. 77pp. Art by Kiyo Komoda. Glossary. Intermediate and upper.

Starting with the Sun worship of the ancients, this book has the reader duplicate the experiments or experiences that taught mankind about the Sun, how Earth moves around it, how it works for us. A complete solar campout is described. Projects require only easily acquired materials.

Adams, Peter. *Moon, Mars and Meteorites*. HMSO, 1977. ISBN 0-11-880672-6. 36pp. Color photos and art. Upper and up.

A pamphlet from the Geological Museum of the British Museum. It concentrates on lunar exploration, describing and illustrating each Apollo landing, and detailing the discoveries made about the geology of the lunar surface. Mars and meteorites are treated only briefly.

Adelman, Saul J., and Benjamin Adelman. *Bound for the Stars*. A Spectrum Book. Prentice-Hall, 1980. LC# 80-17990. Hardcover ISBN 0-13-080390-1. Paperbound ISBN 0-13-080382-0. 335pp. B/w photos and diagrams. Index. Adult.

This volume presents a realistic picture of the barriers blocking our mastery of space and the research needed to overcome them. Then it reveals the intriguing prospect of settling the solar system and exploring the nearer stars. The final chapters discuss other aspects of reality: the political and scientific entity that is the National Aeronautics and Space Administration.

Adler, Irving. *The Stars: Decoding Their Messages.* Revised edition. Crowell, 1980. LC# 77-27665. Trade ISBN 0-690-03993-X. Library binding ISBN 0-690-03994-8. 152pp. B/w photos and diagrams. Index. Glossary. Upper and secondary.

The light we receive from the stars carries their messages . . . if we can read them. This book details the way scientists have learned to read the messages about direction, brightness, color, and the spectrum. The "new windows" on the stars are explained as is what we now know about their life histories.

Aldrin, Col. Edwin E. "Buzz," Jr., with Wayne Varga. *Return to Earth.* Random House, 1973. LC# 73-4864. ISBN 0-394-48832-6. 338pp. B/w photos. Secondary and adult.

The autobiography of the second man to stand on the Moon during the Apollo 11 mission, how he became an astronaut, and finally the painful story of the effects of his public adulation.

Alfven, Hannes, and Gustaf Arrhenius. *Evolution of the Solar System.* NASA SP-345. US GPO, 1976. Stock no. 3300-00613-6. LC# 76-20779. 599pp. B/w photos and diagrams. Index. Bibliography. Adult.

Although quite technical and mathematical in parts, the contents of this volume are so basic to what is now known about our solar system and its evolution that many readers will want to involve themselves in this new and challenging material. The approach integrates chemistry and physics into astronomy. The book is divided into five sections: 1) Present State and Basic Laws, 2) Accretion of Celestial Bodies, 3) Plasma and Condensation, 4) Physical and Chemical Structure of the Solar System, and 5) Special Problems, which includes Earth-Moon relationship, the evolving Sun, and development of Earth's oceans and atmosphere.

Allaway, Howard. *Lessons of the NASA Tech House.* NASA SP-442. US GPO, 1980. Stock no. 3300-00792-2. 40pp. Color photos, diagrams. Secondary and adult.

A nontechnical report for the public on what was learned from the use of the Tech House at NASA Langley Research Center by a family of four during the period of August 1977 to August 1978. The technology, design, and equipment for savings in heating, cooking, and water conservation are described. Also discussed are safety features and personal reactions of the non-engineering-minded family.

________. *The Space Shuttle at Work.* NASA SP-432 and EP-156. US GPO, 1979. Stock no. 3300-0079-5. LC# 79-18459. 84pp. Color and b/w photos and drawings. Index. Secondary and adult.

A nontechnical coverage of the capabilities of the Space Shuttle and the role it will play in a great variety of programs of the future. The history of the design concept is also described. A centerfold shows a cutaway of the Orbiter in great detail.

Allen, David A. *Infrared: The New Astronomy.* A Halsted Press Book. Wiley, 1975. LC# 75-16584. ISBN 0-470-02334-1. 228pp. B/w photos and diagrams. Index. Bibliography. Adult.

Radiant heat, perceived as infrared rays, tells a great deal about our universe. Much of current astronomical research, especially that conducted in space, has revolved around infrared. This volume, among the earliest in this new realm of astronomy, explains the technicalities and discoveries, as well as the prospects for the future, in semitechnical fashion.

Alter, Dinsmore. *Pictorial Guide to the Moon.* Third edition revision by Joseph H. Jackson. Crowell. 1979. LC# 78-22452. ISBN 0-690-01824-X. 224pp. B/w photos. Index. Glossary. Secondary and adult.

A now-classic photographic study of the Moon by a man who cared about Earth's satellite before it became of public interest. The coverage includes drawings from the earliest times to photos taken on the surface. A final chapter proposes that we may some time cover over the small craters on the surface and use them as homes. This 1979 paperbound version is an update of Alter's 1973 Third edition.

Alter, Dinsmore, Clarence H. Cleminshaw, and John G. Phillips. *Pictorial Astronomy.* Fourth edition. Crowell, 1974. 73-15577. ISBN 0-690-00095-2. 328pp. Color and b/w photos, b/w drawings. Index. Glossary. Secondary and adult.

This widely respected and frequently updated "picture-book" of the skies provides the curious of all ages with a well-illustrated introduction to the Sun, our solar system, and the stars and nebulas beyond. A great deal of information is gathered in tables. Many of the photos are from the space program, and a section on space science is included. The book closes with a brief speculation about life in the universe.

American Geophysical Union. *Pioneer Saturn.* Journal of Geophysical Research, Vol. 1, Number A11, November 1, 1980. 307pp. B/w diagrams. Adult.

On September 1, 1979, Pioneer 11 (also called Pioneer Saturn) made a close approach to the ringed planet, first craft to do so. This reprint of a special issue of the *Journal of Geophysical Research* includes forty papers covering the extended analyses of the data returned.

________. *Pioneer Venus.* Journal of Geophysical Research, Vol. 85, Number A13, December 30, 1980. 764pp. Color photos, b/w diagrams. Adult.

A reprint of a special large issue of the *Journal of Geophysical Research* presenting the investigators' papers on the first mission to explore another planet's atmosphere, in late 1978. These are technical papers, describing the discoveries of the orbiter and four atmospheric entry probes released by the orbiter, which are expected to affect our understanding of our own weather systems.

American Institute of Aeronautics and Astronautics. *Space Transportation Systems: 1980-2000*. An AIAA Assessment. Am. Inst. of Aeronautics and Astronautics, 1979. LC# 78-24171. ISBN 0-915928-27-2. 91pp. B/w photos and diagrams. Glossary. Bibliography. Adult.

A volume that looks into innovative use of the Space Shuttle and beyond to even more versatile and advanced space transportation systems.

Ames, Lee J. *Draw 50 Airplanes, Aircraft and Spacecraft*. Doubleday, 1977. LC# 76-51554. Trade ISBN 0-385-12235-7. Library binding ISBN 0-385-12236-5. 64pp. Two-color art by the author. General.

Step-by-step guidance for a novice artist of any age to producing drawings of such aircraft as the Concorde, Boeing 747, Ford Trimotor, Japanese Zero, and the *Spirit of St. Louis*, as well as blimps, balloons, the Apollo Command Module, and Saturn V rocket. Most pages provide six or eight steps toward completing the final drawing.

Anderton, David A. *NASA Aeronautics*. NASA EP-85. US GPO, 1980. Stock no. 3300-00796-5. 28pp. Color photos. Secondary and adult.

Much of the detailed physics of flight is still a mystery. Unraveling that mystery is part of NASA's mission. This colorfully illustrated booklet describes the various aeronautics programs in which NASA plays a role—researching energy, STOL, aerodynamic efficiency, vertical lift, wing structures, and general aviation safety.

________. *Sixty Years of Aeronautical Research: 1917-1977*. NASA EP-145. US GPO, 1978. Stock no. 3300-00736-1. 90pp. B/w photos. Secondary and adult.

Celebrating the seventy-fifth anniversary of powered flight in 1978, this booklet describes and illustrates the activities of the government in aeronautics since the first research laboratory was begun at Langley Field, Virginia, in 1917. Through the years many important improvements in aircraft have been developed and tested in the wind tunnels and other facilities at Langley: for example, a low-drag airfoil, the various X aircraft from the first jet to the incredible X-15, VTOL vehicles, variable-sweep wings, and more. Each is illustrated and described.

Angrist, Stanley W. *Other Worlds, Other Beings*. Crowell, 1973. LC# 70-171001. ISBN 0-690-60205-7. 120pp. Art by Enrico Arno. Intermediate and upper.

Starting with a discussion of the way in which probability of inhabitable planets is calculated, this book carries the reader through the reasoning about life, its origins and needs, the solar system, and the universe, that leads many scientists to postulate "other worlds and other beings." It concludes with the role Earthman might play in space.

Apfel, Necia H., and J. Allen Hynek. *Architecture of the Universe*. Benjamin Cummings, 1979. LC# 78-57260. ISBN 0-8053-4747-X. 499pp. Color and b/w photos and art. Index. Adult.

A new edition of the authors' 1972 textbook, *Astronomy One*, this book takes its title from the original first section in which an overview of the entire universe is presented before it is broken into parts and studied more closely. The text fully integrates all the exciting, new discoveries about our universe and shows the astronomical history that led us to them.

Arno, Roger. *The Story of Space and Rockets*. Bellerophon Books, 1978. ISBN 0-88388-063-6. 48pp. B/w line drawings. Intermediate and upper.

Written and illustrated by a NASA engineer, this coloring book presents in simple terms the history of rocketry, the machinery of the American and Soviet space programs, and a future of the Space Shuttle and proposed space colonies. The detailed line drawings have parts keyed to the text. The book concludes with a table of Rocket Milestones.

Arnold, H. J. P. *Images from Space: The Camera in Orbit*. Dutton, 1979. LC# 79-51327. ISBN 0-7148-2017-2. 72pp. Color and b/w photos. Intermediate and up.

An oversized book containing sixty-four full-page photos, both in full-color and black and white, in these major subject areas: machines, man in spaceflight, Earth, worlds beyond Earth, "visual poetry," and artists' renderings of visions of the future. Explanatory captions for all pictures are gathered at the front of the book.

Asimov, Isaac. *Alpha Centauri, the Nearest Star*. Lothrop, 1976. LC# 76-29037. Trade ISBN 0-688-41779-5. Library binding ISBN 0-688-51779-X. 192pp. Index. Glossary. Upper.

A thorough introduction to the stars, from constellations to stellar motion and brightness, all using Alpha Centauri as a continuing point of reference. The account ends with an exploration of the suitability of various stars for having habitable planets in orbit around them. Numerous tables are used to highlight succinct information.

________. *Asimov on Astronomy*. Anchor Press/Doubleday, 1974. LC# 73-80946. Hardcover ISBN 0-385-04111-X. Paperbound ISBN 0-385-06881-6. 271pp. B/w photos. Secondary and up.

A collection of seventeen essays that originally appeared in *The Magazine of Fantasy and Science Fiction*, arranged in an order so that each expands a bit farther the reader's reach from Earth to its Moon and out into the universe. The essays were written in the 1960s before the major journeys of the space program but the basic information is still valid and interestingly presented.

________. *Asimov on Physics.* Doubleday, 1976. LC# 75-21205. Hardcover ISBN 0-385-00958-5. Paperbound ISBN 0-380-41848-7 from Avon. 204pp. B/w photos. Index. Secondary and up.

Another collection of seventeen early essays from *The Magazine of Fantasy and Science Fiction*, this group discussing a variety of physics subjects, such as Earth's atmosphere, ultrasound, gravitational forces, escape velocity, the speed of light, even entropy. Picture captions and special notes update and enhance the original material.

________. *Asimov's Guide to Science.* Revised edition. Basic Books, 1972. LC# 72-76720. ISBN 0-465-00472-5. 946pp. B/w photos and diagrams. Subject and name indexes. Chapter bibliographies. Secondary and adult.

An enlarged and updated version of the author's *New Intelligent Man's Guide to Science*. This large, nontechnical volume contains practically everything the nonscientist might want to know about the various sciences. Encyclopedic in scope but browse-worthy in style and content, it includes, in fascinating detail, such subjects as the universe, the Earth, our atmosphere, elements, proteins, evolution, the human mind, and a final appendix dealing with the mathematics of science.

________. *A Choice of Catastrophes.* Simon & Schuster, 1979. LC# 79-13946. ISBN 0-671-22701-7. 377pp. Index. Secondary and adult.

Presents a definition of five classes of catastrophes to which our planet and/or our universe might fall victim. 1) The entire universe might change its present properties and structure. 2) Something might happen to our Sun and the solar system. 3) The Earth itself might experience a cosmic convulsion. 4) Something (perhaps man-made) might render Earth uninhabitable. 5) Civilization as we know it might be disrupted, returning humanity to primitive existence.

________. *The Collapsing Universe: The Story of Black Holes.* Walker. 1977. LC# 76-53639. Hardcover ISBN 0-8027-0486-7. Paperbound ISBN 0-671-81738-8 from Pocket Books. 204pp. Index. Secondary and adult.

Pulsars, quasars, black holes, and the "Big Bang" theory are meat and drink to this author and he makes readers feel comfortable with his straightforward explanation of forces and other physical concepts. Then he carries the reader to provinces where the basic physical laws appear to have no meaning. Thus Asimov reaches some astonishing conclusions about the birth and possible collapse of the universe.

________. *Comets and Meteors.* A Beginning Science Book. Follett, 1972. LC# 72-2499. Trade ISBN 0-695-80047-7. Library binding ISBN 0-695-40047-9. 32pp. B/w photos, color art by Raul Mina Mora. Primary and intermediate.

A simple introduction to the dramatic visitors to our skies, with vocabulary helps and suggestions for related "things to do."

________. *Extraterrestrial Civilizations.* Crown, 1979. LC# 79-360. ISBN 0-517-53075-9. 282pp. Index. Secondary and adult.

Exploring the entire subject of the possibility of life elsewhere in the universe, Asimov discusses such questions as, If we're not alone, have "they" already found us on Earth? Should we hunt for them? Is it safe? How could we first detect, then communicate with them? He describes the attributes of life, evolution, and civilization, looking into the likelihood of conditions being right elsewhere. The science of it all is clearly explained for the layperson.

________. *Eyes on the Universe: A History of the Telescope.* Houghton-Mifflin, 1975. LC# 75-15830. ISBN 0-395-20716-9. 274pp. B/w photos. Index. Secondary and adult.

The history of telescopes and the varieties of ways in which they are used, along with the theory of light and radio waves. The author concludes with scientists sending telescopes above Earth's concealing atmosphere and into space, such as with the Large Space Telescope program.

________. *How Did We Find Out about Black Holes?* Walker, 1978. LC# 73-4320. Trade ISBN 0-8027-6336-7. Library binding ISBN 0-8027-6337-5. 64pp. B/w art by David Wool. Index. Intermediate and upper.

A number of events in the history of astronomy are now seen as steps to the contemporary thought that black holes must exist. The people, spacecraft, and other tools involved in the investigations are shown and discussed.

________. *How Did We Find Out about Comets?* Walker, 1975. LC# 74-78115. Trade ISBN 0-8027-6203-4. Library binding ISBN 0-8027-6204-2. 64pp. B/w art by David Wool. Index. Intermediate and upper.

Ancient people, observing the regularity of movement in the night sky, were surprised, even frightened, at the occasional appearance of an unpredictable streamer of foggy light. Over the past centuries many scientists have contributed to what we now know about comets.

________. *How Did We Find Out about Energy?* Walker, 1975. LC# 74-78116. Trade ISBN 0-8027-6205-0. Library binding ISBN 0-8027-6206-9. 64pp. B/w art by David Wool. Index. Intermediate and upper.

The process of discovery of various forms of energy—from mechanical to atomic, the basic law of the conservation of energy, and the problems we face today in our quest for cheap sources of energy are discussed and illustrated.

________. *How Did We Find Out about Outer Space?* Walker, 1977. LC# 76-57064. Trade ISBN 0-8027-6283-2. Library binding ISBN 0-8027-7284-0. 64pp. B/w art by David Wool. Index. Intermediate and upper.

The process of discovery of knowledge about various aspects of space and travel in it: flight, the vacuum of space, rocketry, satellite motion, and manned spacecraft.

________. *How Did We Find Out the Earth is Round?* Walker, 1972. LC# 72-81378. Trade ISBN 0-8027-6121-6. Library binding ISBN 0-8027-6122-4. 64pp. B/w art by Matthew Kalmenoff. Index. Intermediate and upper.

Mankind's first thinking on the flatness of the world, analysis of the movement of stars, eclipses, and calculation of how big Earth's sphere is—these are among the stages in our discovery that Earth is a round planet in space. It was finally actually seen to be round in photos taken from space.

________. *Jupiter, the Largest Planet.* Revised edition. Lothrop, 1976. LC# 75-30294. Trade ISBN 0-688-40044-2. Library binding ISBN 0-688-517787-5. 224pp. B/w photos. Index. Glossary. Upper and secondary.

A blend of scientific information and imaginative speculation concerning the largest planet. A tour of the planet, including its puzzles to which answers are currently being sought, prepares the way for the Pioneer and Voyager probe data that came in after the book was published. Numerous tables highlight facts about the planet and its neighbors.

________. *Mars, the Red Planet.* Lothrop, 1977. LC# 77-24151. Trade ISBN 0-688-41812-0. Library binding ISBN 0-688-51812-5. 224pp. B/w photos and diagrams. Index. Glossary. Upper and secondary.

A look at the way we have viewed our neighboring planet from the earliest realization that it wasn't a fixed star, through discovery of facts about it and the idea of man-made "canals" on Mars, to observation by Mariner probes, and finally the Viking 1 and 2 landings. Numerous statistics and comparisons about Mars are summarized in tables.

________. *The Planet that Wasn't.* Doubleday, 1976. LC# 75-40710. Hardcover ISBN 0-385-11687-X. Paperbound ISBN 0-380-01813-6 from Avon. 206pp. Secondary and adult.

Another collection of essays from *The Magazine of Fantasy and Science Fiction.* This group of seventeen ranges through the search for the planet Vulcan, early views of Mars, discoveries about Jupiter, Saturn and its satellites, to the colonization of space.

________. *Quasar, Quasar, Burning Bright.* Doubleday, 1978. LC# 77-82613. Hardcover ISBN 0-385-13464-1. Paperbound ISBN 0-380-44610-3 from Avon. 240pp. Secondary and adult.

This collection of seventeen essays from *The Magazine of Fantasy and Science Fiction* looks at a variety of subjects close to home: New York City being defended, the American Bicentennial being saluted, around our Earth, climate, comets, and the discovery of Neptune and Uranus. Then it ventures farther out into space: stellar magnitudes, double stars, and microwaves.

________. *The Road to Infinity.* Doubleday, 1979. LC# 78-22362. ISBN 0-385-14962-X. 217pp. Secondary and up.

Seventeen more essays from *The Magazine of Fantasy and Science Fiction* include, among other subjects, numbers, elements, Earth, planets, stars, and the universe. In addition, the volume contains a guide to the 244 previously published essays of Asimov.

________. *Saturn and Beyond.* Lothrop, 1979. LC# 78-21996. Trade ISBN 0-688-41876-7. Library binding ISBN 0-688-51876-1. 224pp. B/w photos, art by Giulio Maestro. Index. Glossary. Upper and secondary.

A simply written but quite comprehensive look at the far reaches of our solar system and what has been learned about it in recent years. Much of the specific data is compiled into tabular form.

________. *Science Past—Science Future.* Doubleday, 1975. LC# 74-25092. ISBN 0-385-09923-1. 346pp. Secondary and adult.

A larger than usual collection of the author's essays, culled from a variety of publications. The first half of the volume deals clearly with the major changes that science has wrought in recent years in atomic energy, electronics, communications, space, as well as several aspects of relevant life sciences. Science Future draws out the imagination to consider possibilities: making supermen, how we'll eat and amuse ourselves in times to come, and how society itself might change if innovative ideas of today come to fruition.

________. *The Solar System.* A Beginning Science Book. Follett, 1974. LC# 73-93548. Trade ISBN 0-695-80473-1. Library binding ISBN 0-695-40473-3. 32pp. Color and b/w photos, color art by David Cunningham. Primary.

Starting with the solar system as a whole, and the forces that hold it together, this small volume deals with satellites, eclipses, asteroids, the possibility of life elsewhere and of other planetary systems. Includes vocabulary helps and suggestions for "Things You Can Do."

________. *The Sun.* A Beginning Science Book. Follett, 1972. LC# 70-184458. Trade ISBN 0-695-80320-4. Library binding ISBN 0-695-40320-6. 32pp. B/w photos, color art by Alex Abel. Primary and intermediate.

A comprehensive but brief introduction to the star holding together our planetary system: sunlight, rainbows, radiation, eclipses, sunspots, flares, solar wind, gravitation. Includes vocabulary helps and suggested things to do.

________. *To the Ends of the Universe.* Revised edition. Walker, 1976. LC# 75-10524. Trade ISBN 0-8027-6236-0. Library binding ISBN 0-8027-6235-2. 141pp. B/w photos and diagrams. Index. Upper and secondary.

The Earth seems flat where a person stands. Moving out from that point, the author develops the idea of the universe, from round Earth, to solar system, to Milky Way, and the extraordinary features being discovered at the ends of the universe. In the course of the book, Asimov takes the reader from a patch of ground beneath our feet to about 70,000,000,000,000,000,000,000 miles away.

________. *The Tragedy of the Moon.* Doubleday, 1973. LC# 73-79641. Hardcover ISBN 0-385-07221-X. Paperbound ISBN 0-440-18999-3 from Dell. 220pp. Secondary and adult.

A collection of essays from *The Magazine of Fantasy and Science Fiction,* including several on the Moon, other worlds, society and technology, and the author's own experiences as a science writer. The title refers to the first essay in which he speculates on how differently mankind might have evolved if there had been no Moon in our sky.

________. *The Universe: From Flat Earth to Black Holes and Beyond.* Revised edition. Walker, 1980. LC# 79-48052. ISBN 0-8027-0655-X. 321pp. B/w photos and art. Index. Bibliography. Secondary and adult.

A satisfyingly complete but comprehensible description of the universe, from our own Earth outward, both in time and space. How we know what we do and who the scientists were who discovered it are covered as thoroughly and knowledgeably as what we know and what we hope to learn in coming years.

Asimov, Isaac, Harry Greenberg, and Charles G. Waugh, editors. *The Science Fictional Solar System.* Harper & Row, 1979. LC# 78-20198. ISBN 0-06-[illegible]11527-0. 317pp. Secondary and adult.

A baker's dozen of unusual science fiction stories concerning our solar system. Each planet gets one (although Pluto gets a bonus story), and the Sun, asteroids, and comets each get one. Asimov introduces each story with the science that may or may not conflict with the science fictional view of the subject.

Augustyn, James. *The Solar Cat Book.* Ten Speed Press, 1979. LC# 79-8515. 96pp. B/w art by Hildy Paige Burns. Glossary. Upper and up.

A mixture of reality and fantasy in which all progress in the understanding and utilization of solar energy was made by cats. Cartoon drawings leave little doubt that cats know considerably more than people do about efficient and economic use of the Sun.

Averner, M. M., and R. D. MacElroy, editors. *On the Habitability of Mars: An Approach to Planetary Ecosynthesis.* NASA SP-414. 1976. Available from NTIS, N77-12718. 105pp. B/w diagrams. Bibliography. Adult.

A collection of papers from university scientists in the various relevant disciplines analyzing the possibility of utilizing Mars as a habitat for earthly life, including human beings. The basic knowledge on which various assumptions are made is described and although the argument becomes fairly technical at times, the possibility of modifying a planet for our use remains intriguing enough to pull the reader along.

Avery, Norman. *Time Out for Tomorrow.* T.H.A.R. Institute, 1977. 160pp. Color art, b/w photos and diagrams. Bibliography. Foreword by astronaut Jim Irwin. Secondary and adult.

A look at various aspects of life today and some alternatives to the way the problems might be solved tomorrow, based on the author's illustrated lecture. Includes communications, transportation, energy, space colonies, health and life style, as well as the search for extraterrestrial life. Many of the possibilities are based on space-related research.

Aylesworth, Thomas G. *Who's Out There? The Search for Extraterrestrial Life.* McGraw-Hill, 1975. LC# 74-31236. ISBN 0-07-002637-8. 120pp. B/w photos. Index. Secondary.

Starting from the fact that many people believe we have been visited by beings from outer space but there is no real evidence to support it, the author explores the structure of life, its possibilities elsewhere, the space program's exploration of our solar system, and ways to communicate with other intelligent beings.

B

Baer, Steve. *Sunspots: An Exploration of Solar Energy through Fact and Fiction.* Cloudburst Press, 1979. LC# 77-153848. Hardcover ISBN 0-88930-062-3. Paperbound ISBN 0-88930-061-5. 127pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

An unusual and fascinating collection of materials from a variety of sources. The facts are those in such topics as the basic workings of the Sun and energy, heat pipes, storage systems, bubble collectors, engines, and the engineer-author's own device of window louvers that open and close in response to the Sun's rays. The fiction comes in pointed little vignettes that appear in boxes scattered throughout the volume.

Bainbridge, William Sims. *The Spaceflight Revolution: A Sociological Study.* Science, Culture, and Society series. Wiley, 1976. LC# 76-21349. ISBN 0-471-04306-0. 294pp. Index. Adult.

A sociologist-engineer analyzes the "spaceflight movement" as a concerted effort on the part of a few space enthusiasts to convince the many that space exploration is a necessary thing—a new concept in theories of technological change. He includes an unusual view of history of spaceflight, explores the role of the science fiction subculture, and discusses the future in which revolution is over but consolidation of gains is carried on.

Baker, David. *The Larousse Guide to Astronomy.* Larousse, 1978. LC# 78-56270. Hardcover ISBN 0-88332-095-9. Paperbound ISBN 0-88332-094-0. 288pp. Color photos, art by David A. Hardy. Glossary. Secondary and adult.

An observer's guide intended for field use, this useful book goes into more detail than the usual guide, exploring astronomical instruments, stars, extraterrestrial life, planetary discoveries from the space program, and the cosmological questions fascinating to the public. Includes numerous tables of data.

_______. *The Rocket: The History and Development of Rocket and Missile Technology.* Crown, 1978. LC# 78-273. ISBN 0-517-53404-5. 277pp. Color and b/w photos and art. Index. Glossary. Secondary and adult.

A large, fully illustrated "coffee-table" volume tracing the political and technological progress of rocket propulsion, culminating in a thorough description from the propulsion point of view of the space program and the military application of strategic missiles. Many illustrations had not been published before. The book ends with a descriptive "compendium of launch vehicles and ballistic missiles" and a world inventory. While younger children may not read the text, all ages will be absorbed by the illustrations in this major book.

_______. *Space Shuttle.* Crown, 1979. LC# 79-52641. Hardcover ISBN 0-517-53885-7. Paperbound 0-517-53649-8. 72pp. Color and b/w photos and art. Index. Secondary and adult.

A comprehensively illustrated and detailed description of the Space Shuttle. A diary of its development and proposed mission use is included. The illustrations are so complete that the reader feels as if he or she were really in the vehicle. The book concludes with illustrations for the model-making hobbyist.

Barrett, E. C., and L. R. Curtis. *Introduction to Environmental Remote Sensing.* A Halsted Press Book. Wiley, 1977. LC# 76-40968. ISBN 0-470-99396-0. 336pp. Color and b/w photos, diagrams. Index. Adult.

An introductory textbook giving a comprehensive account of the methods and equipment used for remote sensing studies. The type of data derived and the environmental facets that can be interpreted from it are fully explored, covering climatology, hydrology, soil, mineral resources, land use, forestry, and urban studies.

Barrowman, Jim. *Calculating the Center-of-Pressure of a Model Rocket.* Technical Information Report 33. Revised edition. Centuri, 1975. 36pp. B/w photos and art. Upper and secondary.

Shows how to calculate and locate the exact center-of-pressure to achieve maximum performance with an adequate margin of stability. Includes design tips plus sample problems.

_______. *Stability of a Model Rocket in Flight.* Technical Information Report 30. Revised edition. Centuri, 1975. 16pp. B/w photos and art. Upper and secondary.

Explains the basic principles of stable rocket flight, clarifying in practical terms the concepts of center-of-gravity and center-of-pressure. Includes simple methods for testing the stability of a rocket.

Bash, Frank. *Astronomy.* Harper & Row. 1980. LC# 76-52524. ISBN 0-06-043853-3. 468pp. Color and b/w photos, two-color diagrams. Index. Glossary. Adult.

A textbook for the nonscience major, by an astronomer who freely confesses that he "deeply loves his subject, is continuously in awe of the beauty of nature and the beauty of its logical structure." Large and dramatic photos bring the objects and processes of astronomy to life, while diagrams clarify the concepts. Special subjects are highlighted as "Portfolios," and brief sidelights, often mathematical, are boxed. Each chapter ends with a summary and questions. An appendix includes material on mathematics and observational astronomy.

Batson, R. M., P. M. Bridges, and J. L. Inge. *Atlas of Mars.* NASA SP-438. US GPO, 1979. Stock no. 3300-00780-9. LC# 79-600164. 160pp. B/w photos and diagrams. Index. Secondary and adult.

Comprises small-scale maps and photomosaics covering the entire surface of the planet Mars. Mariner 9 in 1972 provided most of the data, with additional information from the two Viking Orbiters in 1976 through 1978. The index of place names indicates the source of each name.

Baum, Richard. *The Planets: Some Myths and Realities.* A Halsted Press Book. Wiley, 1973. LC# 73-7583. ISBN 0-470-05930-3. 200pp. B/w photos. Index. Foreword by Patrick Moore. Adult.

An unusual book that asks provocative questions about our solar system, based primarily on the observation of strange (and unconfirmed) phenomena. For example, almost two hundred years ago William Herschel reported seeing a ring around Uranus; its existence was confirmed in 1977. Reports of Jupiter's fifth moon were later confirmed by Barnard. Some of the old questions are updated with material derived by new techniques such as radar pictures.

Becklake, J. *Exploring: Man on the Moon.* HMSO, 1977. ISBN 0-11-290275-8. 28pp. Color and b/w photos, diagrams. Upper and up.

One of a series of booklets developed for an Exploration Exhibition at the Science Museum of the British Museum. This one describes and illustrates the background of the Apollo lunar landing program: the need to know more about the Moon, rocket development, planning the journey, and keeping a man alive in space for so long. Tables list unmanned flights to the Moon and all manned spaceflights through 1976.

Beer, Tom. *The Aerospace Environment.* Wykeham Science Series. Crane, Russak, 1975. LC# 75-38717. ISBN 0-387-91124-3. 144pp. B/w drawings. Index. Adult.

A semitechnical supplementary textbook on the interaction of Earth's outer envelope (the upper atmosphere) with space, radio wave movement, the ionosphere, and the magnetosphere. A final brief look is given to the aeronomy of other planets, particularly Venus, Mars, and Jupiter. The coverage is fairly mathematical in parts.

Behrman, Daniel. *Solar Energy: The Awakening Science.* Little, Brown, 1976. LC# 76-19000. Hardcover ISBN 0-316-08771-8. Paperbound ISBN 0-316-08772-6. 408pp. B/w photos by Madeleine de Sinéty. Index. Adult.

A personal, intelligent, and readable account of how solar energy is being used all over the world. Included are the politics involved, the ways in which various contemporary scientists have explored the subject, and forecasts for the future. Photographs of the many individuals interviewed and at work in the field enliven the subject.

Belew, Leland F., editor. *Skylab, Our First Space Station.* NASA SP-400. US GPO, 1977. Stock no. 3300-00670-5. LC# 76-51417. 176pp. Color photos. Index. Secondary and up.

First in a series of abundantly illustrated, hardcover volumes detailing the historic and scientifically far-reaching Skylab missions. This book provides a general introduction to the Skylab mission, its problems and its triumphs, not only in the study of man in extended weightlessness but also in the gathering of a wealth of information about Earth, our solar system, weather observation from on high, and the Sun.

Belew, Leland, F., and Ernst Stuhlinger. *Skylab: A Guidebook.* NASA EP-107. US GPO, 1973. Stock no. 3300-00508-3. 256pp. B/w photos. Glossary. Bibliography. Acronym list. Secondary and adult.

A detailed description of the Skylab program, missions, and equipment, prepared before the mission began, by the scientists and engineers involved. The volume is still useful for complete details on Skylab components, crew preparation, and research experiments carried. Numerous photos are used to give a close-up look at equipment.

Bendick, Jeanne. *The Big Strawberry Book of Astronomy.* Larousse, 1979. LC# 78-78321. T[illegible]de ISBN 0-88470-058-5. Library binding ISBN 0-884[illegible]59-3. Paperback ISBN 0-88470-060-7. 61pp. Col[illegible] art by Sal Murdocca. Index. Intermediate.

Mysteries to be solved about our solar system. Think big, the author instructs, as she introduces the concept of the universe and details the historical discoveries that brought our knowledge to its current state. Cartoon-type illustrations highlighting major points alternate with full-color art. The conclusion challenges the reader to help solve the remaining mysteries.

________. *Putting the Sun to Work.* Good Earth series. Garrard, 1979. LC# 78-6178. ISBN 0-8116-6111-3. 64pp. Artwork. Index. Primary.

Personal experience reveals the energy from our Sun. It can be caught (in clothing and houses); it can be concentrated for heat or power generation; it can be converted directly by solar cells. This early introduction uses personal involvement, including formal experiments, throughout the text.

Benson, Charles D., and William Barnaby Faherty. *Moonport: A History of Apollo Launch Facilities and Operations.* NASA History Series SP-4204. US GPO, 1978. Stock no. 3300-00740-0. LC# 77-29118. 633pp. B/w photos and diagrams. Index. Bibliography. Adult.

A complete description of the Apollo program as seen from an unusual viewpoint: the development and use of the fascinating Cape Kennedy Launch Complex, home base for all the flights to the Moon. Interesting sidelights are given on the impact of the program on labor and life on the Florida coast. The Apollo complex has been modified to serve as the Space Shuttle port.

Berendzen, Richard. *Life Beyond Earth and the Mind of Man.* NASA SP-328. US GPO, 1973. Stock no. 3300-00518-1. LC# 73-600150. 116pp. Secondary and adult.

In November 1972, a symposium was held at Boston University to explore the implications of the possibility of communicating with intelligent beings from elsewhere in the universe. Participants were astronomer Richard Berendzen, anthropologist Ashley Montagu, physicist Philip Morrison, astronomer and exobiologist Carl Sagan, theologian Krister Stendahl, and biologist George Wald. This small volume is a transcript of the provocative discussion.

Berendzen, Richard, Richard Hart, and Daniel Seeley. *Man Discovers the Galaxies.* Science History Publishers, 1976. LC# 75-4688. Hardcover ISBN 0-88202-023-4. Paperbound ISBN 0-685-55361-2 from N. Watson. 228pp. B/w photos. Index. Secondary and up.

The work of the scientists, primarily in the twentieth century, who have discovered the galaxies, including their thoughts, their methods, their instruments. Thus the book concentrates on a single, highly significant episode in the development of modern science. Each section concludes with problems posed to the reader. Intended for use primarily in courses for non-science majors.

Bergaust, Erik. *Colonizing Space.* Putnam, 1978. LC# 77-11147. ISBN 0-399-61113-4. 64pp. B/w photos. Index. Upper.

An explanation for young people of Gerard K. O'Neill's plan (see O'Neill: *The High Frontier*) for permanent space stations and the development of manned stations in orbit to collect solar energy and transmit it to Earth. Concludes with a description of what life might be like in such a space colony.

________. *Colonizing the Planets: The Factual Story of Manned Interplanetary Flight into the 21st Century.* Putnam, 1975. LC# 75-7861. Trade ISBN 0-399-20471-7. Library binding ISBN 0-399-60961-X. 96pp. B/w photos and art. Index. Upper.

An informative look at our solar system, how we can explore it both with unmanned probes and manned expeditions, and how the planets might be changed by us to facilitate their colonization.

________. *The Next 50 Years on the Moon.* Revised edition. Putnam, 1974. LC# 73-77419. Trade ISBN 0-399-20362-1. Library binding ISBN 0-399-60851-6. 96pp. B/w photos and art. Index. Glossary. Intermediate and upper.

A science-fiction-sounding but realistic projection of how man will explore and put to use the Moon and how it will serve as a base from which to explore the rest of the solar system. The scientific base will soon evolve into a full city. The book ends with a timetable for the next fifty years. Appendixes contain lunar and comparative data.

________. *Rescue in Space: Lifeboats for Astronauts and Cosmonauts.* Putnam, 1974. LC# 73-92594. Trade ISBN 0-399-20403-2. Library binding ISBN 0-399-60894-X. 96pp. B/w art. Index. Intermediate and upper.

A favorite fictional device has been the idea of astronauts stranded in orbit, defeated in the quest to return home by the physics of spaceflight. The United States almost lost astronauts on the flight of Apollo 13. The Soviet Union has lost several cosmonauts on the return legs of their journeys. The author explores the difficulties and costs of planning for rescue ventures, several systems that have been proposed, the international politics involved, and the possibilty of using the Space Shuttle as a rescue system. Concludes with a chronology of manned spaceflight.

________. *Wernher von Braun.* National Space Institute, 1976; dist. by Stackpole. LC# 76-29508. Hardcover ISBN 0-917680-01-4. Paperbound ISBN 0-8117-2098-5 from Stackpole. 599pp. B/w photos. Index. Secondary and up.

The authorized biography of the "father of modern American rocketry" by an author who knew von Braun for twenty-five years and worked with his friends and associates as well as published materials to write this comprehensive view of the scientist who developed the Saturn V rocket. Using von Braun as the focal point, the author fully details the complete history of rocketry since the 1930s, making the volume more than just the story of one man.

Berger, Melvin. *Energy from the Sun.* A Let's-Read-and-Find-Out Science Book. Crowell, 1976. LC# 75-33310. ISBN 0-690-01056-7. 40pp. Art by Giulio Maestro. Primary.

An introduction to the concept that most heat and energy on Earth comes originally from the Sun, regardless of the form in which we use it. A simple experiment illustrating that the Sun can heat water is the starting point.

________. *The New Earth Book: Our Changing Planet.* Crowell, 1980. LC# 79-7828. Trade ISBN 0-690-00735-7. Library binding ISBN 0-690-04074-1. 128pp. B/w art by George DeGrazio. Index. Bibliography. Intermediate and upper.

Recently there have been dramatic advances in our knowledge about Earth. This book covers what we know about our planet with emphasis on how we know it. Earth in space, inside the planet, the changing surface, the atmosphere, and Earth's history are among the major topics discussed.

________. *Planets, Stars and Galaxies.* Putnam, 1978. LC# 78-16688. ISBN 0-399-61104-5. 64pp. B/w photos. Index. Intermediate and upper.

An introduction to our universe through the eyes of contemporary astronomers and to the discoveries of modern astronomy. Filled with basic facts about our solar system, the Sun and other stars, the Milky Way and other galaxies, the book shows how modern astronomy is opening the doors to the unknown regarding the birth of a star, interplanetary communication, black holes, supernovas, white dwarfs . . . and more.

________. *Quasars, Pulsars and Black Holes.* Revised edition. Putnam, 1977. LC# 76-50057. Trade ISBN 0-399-20562-4. Library binding ISBN 0-399-61061-0. 64pp. B/w photos. Index. Glossary. Intermediate.

There are billions of regular stars in the visible universe, but other objects with special characteristics are challenging the long-held views of nature: very, very bright light sources called quasars, pulsars that emit regular bursts of radio waves, and the huge population of ex-stars called black holes.

Berman, Arthur I. *Space Flight*. Science Study series. Anchor Press/Doubleday, 1979. LC# 74-18841. ISBN 0-385-02754-0. 206pp. B/w photos and art. Index. Adult.

For star warriors and space opera buffs, this paperback provides an informal account of the scientific principles of spaceflight, offering explanations of such concepts as weightlessness, solar propulsion, trajectories, and artificial gravity. It is topped off by an awesome vision of the future of spaceflight—the possibilities of interstellar voyages as well as the practical benefits of space technology.

Berman, Louis, and John C. Evans. *Exploring the Cosmos*. Third edition. Little, Brown, 1980. LC# 79-90887. ISBN 0-316-09176-6. 491pp. Color photos and b/w photos and art. Index. Glossary. Bibliography. Free instructor's manual. Adult.

A textbook for nonscience majors that keeps mathematics to a minimum and includes a fair sprinkling of the popular subjects such as exobiology, interstellar flight, and cosmology. Each chapter ends with review questions and a bibliography. Project suggestions are also included.

Berry, Adrian. *The Iron Sun: Crossing the Universe through Black Holes*. Dutton, 1977. LC# 76-52318. Hardcover ISBN 0-525-13490-5. Paperbound ISBN 0-446-89796-5 from Warner. 175pp. Index. Glossary. Bibliography. Adult.

An imaginative discussion of the possibility of using black holes as "bridges" for instantaneous travel to other parts of the universe, thus bypassing the barrier of time and distance that appears to limit manned space travel. The author first describes, in understandable terms, the nature of black holes and then outlines a plan to manufacture them artificially within easy reach of Earth. Several brief appendixes discuss technical questions not covered in the text.

________. *The Next Ten Thousand Years: A Vision of Man's Future in the Universe*. Saturday Review Press/Dutton, 1974. LC# 73-16795. Hardcover ISBN 0-8415-0302-8. Paperback ISBN 0-451-61601-4 from New American Library. 250pp. Index. Glossary. Bibliography. Foreword by Robert Jastrow. Adult.

A more daring, far-reaching forecaster than most writers, the author proposes that we will find it necessary to redesign our solar system to meet the needs of populations and energy requirements. He shows how all the mechanisms of the cosmos can be utilized for humanity's benefit. All of the proposals are based on the thinking of respected scientists.

Bhatt, S. *Legal Controls of Outer Space: Law, Freedom and Responsibility*. International Publications Service, 1974. 372pp. Bibliography. Adult.

A full commentary by an Indian specialist on the Space Treaty of 1967, its background declaration by the United Nations, and a projection of what actions might be required in the future relating to the Moon, planets, and other bodies. Appendixes reproduce the major instruments of international space law.

Biemann, Hans-Peter. *The Vikings of '76*. H-P Biemann, 1977. LC# 77-71945. 144pp. B/w photos. Secondary and adult.

One young man's personal report in photos and extensive captioning of the entire Viking mission to Mars. The author, a camera-bearing student, documented the events at NASA's Jet Propulsion Laboratory during the search for a landing site, the Viking landings, the search for life, exploring Chryse, and investigating the land.

Billingham, John, William Gilbreath, and Brian O'Leary, editors. *Space Resources and Space Settlements*. NASA SP-428. US GPO, 1979. Stock no. 3300-00765-5. 300pp. Color art, b/w photos and diagrams. Adult.

During the summer of 1975, five task groups, working under study director Gerard K. O'Neill at the NASA Ames Research Center, produced technical study papers in five areas involving space manufacturing and habitation. The papers gathered in this volume are the result of that work. While they tend to be technical in detail, the proposals for future living have an interest that will carry a nontechnical reader along. The five areas studied are: 1) Research Needs for Regenerative Life-support Systems, 2) Habitat Design, 3) Dynamics and Design of Electromagnetic Mass Drivers (devices used to accelerate payloads to predetermined velocities and then release them), 4) Asteroids as Resources for Space Manufacturing, and 5) Processing of Nonterrestrial Materials.

Black, David C., editor. *Project Orion, A Design Study of a System for Detecting Extrasolar Planets*. NASA SP-436. US GPO, 1980. Stock no. 3300-00790-6. LC# 80-11728. Color photos and b/w diagrams. Adult.

A somewhat technical discussion of the nature and feasibility of optical methods for detecting planets outside the solar system. Considered is a ground-based imagery Stellar Interferometer covering approximately four acres to be located on a mesa in southwestern Arizona.

Blaine, J. C. D. *End of an Era in Space Exploration: From International Rivalry to International Cooperation*. Vol. 42 in the AAS Science and Technology series. AAS, 1976. ISBN 0-87703-080-4. 199pp. B/w photos. Index. Bibliography. Adult.

A nontechnical history of that period the author calls "the first era of the Space Age characterized by great advances in technology engendered in part by a contest between the Soviet Union and the United States in the exploration of the moon and planets of the solar system." Thus it is a contrast between a human centered and a machine-centered approach, with spectacular feats achieved by both nations, leading to ultimate cooperation.

Blanchard, Paul A. *Atoms and Astronomy.* NASA EP-128. US GPO, 1977. Stock no. 3300-00656-0. 32pp. B/w photos and diagrams. Glossary. Secondary and adult.

A booklet prepared in cooperation with the American Astronomical Society for use by secondary school science teachers. Astronomical spectroscopy is first introduced in nontechnical language, calling spectroscopy the means by which astronomers acquire information about distant celestial phenomena, based on the fact that atoms emit and absorb electromagnetic radiation in different ways. Questions with answers and advanced exercises are given. The other three booklets in the series are: Gammon, *Chemistry Between the Stars;* Jacobs, *Extragalactic Astronomy;* and Straka, *The Supernova.*

Bluth, B. J., and S. R. McNeal, editors. *Update on Space, Volume I.* National Behavior Systems, 1980. LC# 80-52460. ISBN 0-937654-00-0. 196pp. B/w photos and art. Index. Secondary and adult.

First in a planned series of volumes intended to provide reliable and accurate information "to those hoping to learn and become part of the creation of a human presence in the limitless frontier of space." This volume collects a series of lectures by insiders on space, regarding space stations, industrialization, effects of long-duration spaceflight, the Shuttle and Solar Power Satellite, the military, and the future.

Bodechtel, Johann, and Hans-Gunter Gieroff-Emden. *The Earth from Space.* Arco, 1974. LC# 72-97584. ISBN 0-668-02960-9. 176pp. Color photos and art. Secondary and adult.

Includes a chronology of space photography events from the first picture of Earth from space (made by Explorer 6 in 1959) through the last Apollo flight in 1972. The introduction covers the variety of human endeavors that can utilize space photography. Diagrams are used to explain how various photos were taken or what they reveal.

Boesen, Victor. *Doing Something about the Weather.* Putnam, 1975. LC# 75-10440. Trade ISBN 0-399-20465-2. Library binding ISBN 0-399-60955-5. 120pp. B/w photos. Index. Upper and secondary.

Starting with the concept that Earth is a "garden in space" and the atmosphere is a "fence" around that garden, the author discusses ways in which scientists are endeavoring to subdue or relocate events in the atmosphere. Concludes with a review of the atmospheric investigation program carried out by astronauts aboard Skylab.

Bonestell, Chesley, and Arthur C. Clarke. *Beyond Jupiter: The Worlds of Tomorrow.* Little, Brown, 1973. LC# 72-6440. ISBN 0-316-14699-4. 90pp. Color and b/w paintings and photos. Upper and up.

As astronomical artist of imagination and a scientist/science fiction writer carry us along on a journey made by a hypothetical space probe taking advantage of the orbital alignment of the outer planets of our solar system that occurred in the late 1970s.

Bonneau, B. Lee, and Billy A. Smith, editors. *Astronomy Illustrated.* Third edition. Kendall/Hunt, 1980. ISBN 0-8403-2168-6. 248pp. B/w photos and art. Index. Upper and up.

An unusual photo and art guide to astronomy that really serves as a graphic reference to the terms and concepts of astronomy. It can supplement an introductory course or serve as an educator's source book. The five units are: 1) The Constellations; 2) Atoms, Light, Spectra; 3) The Solar System; 4) The Stellar System; and 5) The Galactic System. Both drawings and photos are used to clarify the concepts, in the type of illustrations educators find useful to put on blackboards.

Bono, Philip, and Kenneth Gatland. *Frontiers of Space: Pocket Encyclopedia of Space in Color.* Revised edition. Macmillan Color series. Macmillan, 1976. LC# 76-2028. ISBN 0-02-542810-1. 279pp. Color photos and art. Index. Upper and up.

Details of realistic forecasts of space programs that have been proposed or actually planned based on existing technology. Among them are methods for viewing our world, rescue missions, manned trips to the planets, and rocket engine advances.

Boulton, John. *Basic Steps in Astronomy.* A Blandford Press Book. Sterling, 1980. ISBN 0-8069-9426-6. 144pp. Color photos, b/w drawings. Index. Secondary and adult.

An introduction for the serious amateur astronomer, starting with the equipment one must build or buy. Combines practical advice on observation with explanations of the important theories of astronomy, with reference to space-program research. Appendixes include double, variable, nearest, and brightest stars; star clusters; constellations; and monthly star charts.

Bova, Ben. *The Fourth State of Matter: Plasma Dynamics and Tomorrow's Technology.* St. Martin's, 1971. LC# 75-145445. 181pp. B/w photos and drawings. Index. Bibliography. Upper and secondary.

Simplifies and makes fascinating plasma physics as a potential major factor in the life of the young reader. Using the definition that plasma is "a gas that conducts electricity," most of the universe is plasma—the "weather" of space. The author describes the historical setting that led to current discoveries in space and on Earth.

________. *The New Astronomies.* St Martin's, 1972. LC# 70-184553. 214pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

A survey of developments in the science of astronomy during what the author calls the "Third Era in Astronomy," the very recent period since the construction of the massive Mount Palomar Observatory. During this period, our conventional view of astronomy has been drastically transformed. The author introduces to the layperson radio telescopes, radar, infrared and ultraviolet detectors, neutrino traps, space probes, and more—all devices and processes that are turning astronomy into an active, vital science.

________. *The Seeds of Tomorrow.* McKay, 1977. LC# 77-264. ISBN 0-679-20417-2. 122pp. B/w photos. Index. Upper and secondary.

Takes a glimpse into the future through modern science. The subjects include fuels of the future, explosion in information technology, future exploration of outer space, the new biology, and atomic energy. Opens the eyes to the possible wonders our future may bring.

________. *Starflight and Other Improbabilities.* Westminster Press, 1973. LC# 72-7332. ISBN 0-664-32520-3. 126pp. B/w photos and drawings. Upper and secondary.

An exploration of the "thin edge" between science fact and speculation. Using solid foundations from which to launch a variety of "what ifs," Bova clarifies and bridges the gap between the theoretical and practical in reference to travel to the stars, searching for alien intelligences, and gravitational collapse.

________. *Through Eyes of Wonder: Science Fiction and Science.* An Addisonian Press Book. Addison-Wesley, 1975. LC# 74-13893. ISBN 0-201-09206-9. 128pp. B/w photos and art. Index. Upper and secondary.

The author was himself "hooked on astronomy, rocketry, and science fiction" after seeing one issue of "Superman." He relates the parallel march of science and science fiction and the way they contribute to each other, using examples from the best of science fiction.

________. *Workshops in Space.* Dutton, 1974. LC# 74-4482. ISBN 0-525-43260-4. 67pp. B/w photos. Index. Intermediate.

The author calls the period the space program is now in "Phase II"—the technique of getting safely into space has been learned, and now we're utilizing those techniques to study problems close to home. The author deals with Skylab, Earth resources satellites, Apollo-Soyuz, and the Space Shuttle.

Bova, Ben, editor. *The Analog Science Fact Reader.* St. Martin's, 1974. LC# 73-87298. ISBN 0-312-03220-X. 211pp. B/w photos and drawings. Secondary and adult.

A paperbound collection of twelve fact-based but very future-oriented articles that appeared in *Analog Science Fiction-Science Fact.* Each challenges our basic notions about directions our lives may take. Topics discussed include a water-fueled automobile, weight-lifting robots, computers, meteor-strike to Earth, interstellar visitors, flying saucer design, and science fiction, which the author finds too conservative.

________, with Trudy E. Bell. *Close Up: New Worlds.* St. Martin's, 1977. LC# 75-9467. Hardcover ISBN 0-312-14490-3. Paperbound ISBN 0-312-14491-1. 222pp. Color and b/w photos. Glossary. Foreword by Mark Chartrand, Director of Hayden Planetarium. Secondary and adult.

A group of imaginative science-fiction writers who are scientists in their own right makes some far-reaching observations on the solar system, what has been discovered in recent years, and speculations on what might be found in coming years and adventures. Our solar system's planets are now seen as "New Worlds" because what we have learned since the Space Age began has completely altered our view of them . . . as well as of our own planet, Earth.

Boyd, Grant. *Model Rocket Design Manual.* Revised edition. Centuri, 1975. 32pp. B/w photos and art. Index. Upper and secondary.

For the more advanced model rocketeer who is ready to design and build his or her own rockets. Major emphasis is given to stability and how to insure it in the design. All parts may be custom-made except the engine itself. Altitude, payloads, staging, gliding, clusters, and building real rockets to scale are illustrated.

________. *Rocketry Exploration: Power-System Handbook.* Centuri, 1977. 24pp. B/w photos and art. Intermediate and up.

A graphic introduction to the basics of model rocketry, presenting historical background and construction techniques, as well as seven projects for learning to prepare, launch, and test the basic X-7 and more advanced, clustered X-16 Centuri rockets.

Boyer, Robert W. *How to Study the Earth from Space.* An NSTA Instructional Aid. National Science Teachers Ass'n, 1971. Stock no. 471-14624. 12pp. B/w photos. Adult.

Written before the launch of Landsat, this pamphlet provides a useful introduction to remote sensing imagery and its applications in Earth resources, geology, agriculture, and other areas.

Boyle, Charles P. *Space Among Us.* American Society for Aerospace Education, 1974. 133pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

This is a collection, originally developed for NASA's Goddard Space Flight Center, of brief articles, describing the way space is involved in our everyday lives. Written in a casual, relaxed fashion, it clearly describes the ubiquity of space influence. A long collection of appendixes reproduces poetry, newspaper ads, letters, and other items.

Bracewell, Ronald N. *The Galactic Club: Intelligent Life in Outer Space.* LC# 74-23056. Portable Stanford series: San Francisco Book Co., 1974. Hardcover ISBN 0-913374-40-7. Paperbound ISBN 0-913374-41-5. University Portable series: Freeman. Hardcover ISBN 0-7167-0353-X. Paperbound ISBN 0-7167-0352-1. 141pp. B/w art. Index. Adult.

The author, a Stanford University professor of electrical engineering who designs radio telescopes, covers the current theories about extraterrestrial life in a comfortable style that details fairly technical concepts for laypersons. He goes into the enormous problems of direct radio communication with other worlds and suggests that more advanced civilizations may instead contact Earth by use of interstellar probes which will establish the basis for later radio communications.

Bradbury, Ray, et al. *Mars and the Mind of Man.* Harper & Row, 1973. LC# 72-9746. ISBN 0-06-010443-0. 143pp. B/w photos. Secondary and adult.

On the eve of the arrival of Mariner 9 to orbit Mars, California Institute of Technology held a panel discussion in which five distinguished scientists and writers shared their views of Mars and its meaning in the mind of man, before any discoveries by the orbiting spacecraft might narrow our view. The participants were Ray Bradbury, Arthur C. Clarke, Bruce Murray, Carl Sagan, and Walter Sullivan. The first part of this volume reports that discussion. In the concluding half of the book, prepared long after Mariner 9 photos started returning to Earth, each participant comments on new knowledge of the planet and on the earlier discussion in light of new discoveries.

Brand, Steward, editor. *Space Colonies.* Co-Evolution Quarterly, 1977. ISBN 0-14-004805-7. 160pp. B/w photos. Index. Secondary and adult.

Starting with Dr. Gerard K. O'Neill's vision of space colonization (see O'Neill: *The High Frontier*), many contributors comment on and debate the subject. Among them are historian Lewis Mumford, astronaut Russell Schweickart, astronomer-exobiologist Carl Sagan, Nobel biologist George Wald, author-engineer T. A. Heppenheimer, and oceanographer Jacques Cousteau. The final section is a collection of space topics such as Mars controversy, personal hygiene in zero gravity, solar sailing, and book reviews.

Brandt, John C., and Stephen P. Maran. *New Horizons in Astronomy.* Revised edition. Freeman, 1979. LC# 78-11717. ISBN 0-7167-1043-9. 614pp. Color and b/w photos, diagrams. Index. Bibliography. Adult.

An introductory textbook for nonscience majors which endeavors to portray astronomy as a living subject. The authors set themselves the following criteria: "avoidance of mathematics, emphasis on the relationship of life (and indeed the individual himself) to the astronomical universe, the involvement of astronomy in fundamental questions that have occupied thought in the context of the struggle for knowledge, with the adversary being sometimes Nature, and sometimes Man and his institutions." A great deal of material and artwork is drawn from the space program.

________. *Telescopes and Space Exploration.* US GPO, 1976. Stock no. 3300-00647-1. 16pp. Color photos and art. Upper and up.

A colorfully illustrated discussion of why it is of value to astronomers to loft their telescopes and other astronomical equipment above Earth's atmosphere. Radiation in different regions of the electromagnetic spectrum behave differently when entering the atmosphere. Specific case histories are examined: the discovery of a pulsar in the Crab Nebula, investigation of solar flares, an analysis of interstellar gas, and the search for black holes.

Brandt, John C., and Stephen P. Maran, editors. *New Astronomy and Space Science Reader.* Freeman, 1977. LC# 76-54316. Hardcover ISBN 0-7167-0350-5. Paperbound ISBN 0-7167-0349-1. 371pp. B/w photos and diagrams. Index. Bibliography. Adult.

A collection of articles on subjects of current astronomical research interest, as well as on the newer techniques being used. Forty-four articles make up twelve sections: 1) historical astronomy; 2) telescopes and observatories; 3) asteroids, meteors, and comets; 4) the Moon and planets; 5) our Sun; 6) the stars; 7) birth and death of stars; 8) interstellar matter and the Milky Way; 9) galaxies and the universe; 10) Space-Age astronomy; 11) problems in modern astronomy; and 12) "Epilogue: A Message from Earth."

Branley, Franklyn M. *The Beginning of the Earth.* A Let's Read-and-Find-Out Science Book. Crowell, 1972. LC# 79-184979. Trade ISBN 0-690-12987-4. Library binding ISBN 0-690-12988-2. 40pp. Color art by Giulio Maestro. Primary.

Describes very simply the current ideas on the formation of Earth from a cloud of dust and gases and its subsequent evolution. It leaves open as a whole question where the cloud of dust and gases came from in the first place.

________. *Black Holes, White Dwarfs, and Super Stars.* Exploring Our Universe series. Crowell, 1976. LC# 75-42417. ISBN 0-690-01068-0. 113pp. B/w art by Helmut K. Wimmer. Index. Upper and secondary.

A solid introduction to the stars, their life sequences, exploding stars, and the fascinating pulsars, neutron stars, and black holes. The black and white artwork gives the appearance of three dimensions. Appendixes cover the magnitude scale, spectrum classification, the twenty-five brightest stars, and the fifteen nearest stars.

________. *Columbia and Beyond: The Story of the Space Shuttle.* Collins, 1979. LC# 78-26891. ISBN 0-529-05525-2. 88pp. Color and b/w photos and drawings. Index. Intermediate.

An introduction to the Space Shuttle as a functioning tool in the development of the industrialization of space. The Orbiter called *Columbia* is used to introduce the history of the space program and the growing need for such a versatile tool. A chapter is devoted to the Spacelab development by the European Space Agency.

________. *Comets, Meteoroids and Asteroids: Mavericks of the Solar System.* Exploring Our Universe series. Crowell, 1974. LC# 73-16043. ISBN 0-690-20176-1. 115pp. B/w art by Helmut K. Wimmer. Index. Upper and secondary.

There are numerous objects that move through our solar system in addition to the planets and their satellites. Any night-sky watcher can see meteors, and we can visit the craters left by meteorites. Other fascinating visitors are asteroids, comets, tektites, and organic molecules found both in meteoroids and in space itself.

_______. *The Electromagnetic Spectrum: Key to the Universe.* Exploring Our Universe series. Crowell, 1979. LC# 77-26591. Trade ISBN 0-690-03868-2. Library binding ISBN 0-690-03869-0. 126pp. B/w photos and art by Leonard D. Dank. Index. Bibliography. Upper and secondary.

Basic physics for the young adult or anyone who wants to comprehend the techniques used to perceive and explore our universe. The history of the discovery of each segment of the spectrum is described, as well as how it is being used to explore both tiny subatomic particles and the infinite universe.

_______. *The End of the World.* Crowell, 1974. LC# 72-13264. Trade ISBN 0-690-26607-3. Library binding ISBN 0-690-26608-1. 48pp. Color art by David Palladini. Intermediate.

An exploration of the various theories on ways in which the world might end. Could the Sun explode? Might the Earth gradually cover with ice? And where would mankind be when this happens?

_______. *Energy for the 21st Century.* Crowell, 1975. LC# 74-31144. ISBN 0-690-00756-6. 86pp. B/w art by Henry Roth. Index. Intermediate and upper.

A review of the place of energy and power in our lives, and the way our demands have grown. Prospects for further utilization of fossil fuels are discussed as are nuclear, solar, and other sources of energy. Concludes with futuristic possibilities of harnessing the energy in a black hole and using hydrogen for the storage of energy.

_______. *Experiments in the Principles of Space Travel.* Revised edition. Crowell, 1973. LC# 72-7543. ISBN 0-690-27792-X. 113pp. Art by Jean Yee Wong. Index. Upper.

Demonstrations and explanations of the basic laws of physics that include rocket research and unmanned and manned space travel, starting with a brief study of what destinations are possible in our solar system and beyond. All equipment called for is easily obtainable.

_______. *The Moon: Earth's Natural Satellite.* Exploring Our Universe series. Crowell, 1972. LC# 76-146279. Trade ISBN 0-690-55415-X. Library binding ISBN 0-690-55416-8. 117pp. B/w art by Helmut K. Wimmer. Index. Bibliography. Upper and secondary.

A complete updating of our knowledge of the Moon after the end of the Apollo Program. It begins with all the basic information known before: eclipses, motion, phases, and so on. Then it goes into a complete description of the Moon as it is now known to be, both on the nearside and farside.

_______. *The Nine Planets.* Revised edition. Exploring Our Universe series. Crowell, 1978. LC# 77-26604. Trade ISBN 0-690-03848-8. Library binding ISBN 0-690-03849-6. 86pp. B/w art by Helmut K. Wimmer. Index. Upper.

The basic and interesting story of the planets circling our Sun, along with the other members of the solar system family. Information is updated through the Pioneer and Viking programs.

_______. *Pieces of Another World: The Story of Moon Rocks.* Crowell, 1972. LC# 71-158684. Trade ISBN 0-690-62565-0. Library binding ISBN 0-690-62566-9. 64pp. Color photos, b/w art by Herbert Danska. Index. Intermediate and upper.

Except for meteorites, the Moon rocks brought back by Apollo astronauts were the first pieces of another world we've been able to study. This book describes, with some touches of suspense, how the lunar samples were collected, how they were handled on their arrival on Earth, and what has been discovered from their study.

_______. *Solar Energy.* Revised edition. Crowell, 1975. LC# 75-17222. ISBN 0-690-00719-1. 86pp. B/w art by John Teppich. Index. Intermediate and upper.

Explains what solar energy is and how scientists propose to put it to work, especially for heat and electricity. Simple experiments involving solar energy are incorporated in the text.

_______. *Weight and Weightlessness.* A Let's-Read-and-Find-Out Science Book. Crowell, 1971. LC# 70-132292. Trade ISBN 0-690-87328-X. Library binding ISBN 0-690-87329-8. 40pp. Art by Graham Booth. Primary.

The "why" of the puzzling fact that we have a certain weight on Earth, a different one on the Moon, and none at all in space. Discusses gravity, free fall, and orbits.

Branley, Franklyn M., and Mark R. Chartrand, III. *Astronomy.* Crowell, 1975. LC# 74-28364. ISBN 0-690-00760-4. 564pp. Color and b/w photos, b/w art by Helmut K. Wimmer. Index. Glossary. Adult.

An introductory textbook without mathematical complications. It starts with the total universe, ways to observe it, and stars and galaxies; then it moves in for a closer look at Earth and its vicinity. A concluding chapter discusses the search for extraterrestrial life. The technique used in the illustrations gives them a third dimension that clarifies many astronomical concepts. Each chapter concludes with review information, questions, and further reading suggestions.

Briggs, Gary O. *Move Over Jet—Here Comes Zep!* Mojave Books, 1977. ISBN 0-87881-059-5. 64pp. B/w photos and art. Secondary and adult.

An imaginative, paperbound collection of fact, fiction, documentary, and poetry about lighter-than-air "ships," proposing their return and redevelopment for the future. Illustrations and a quiz highlight the history of dirigible flight.

Brooks, Courtney G., James M. Grimwood, and Loyd S. Swenson, Jr. *Chariots for Apollo: A History of Manned Lunar Spacecraft.* NASA History Series SP-4205. US GPO, 1979. Stock no. 3300-00768-0. 540pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

A comprehensive and fascinating nontechnical history of the development and operation of the Apollo spacecraft, for which each of the three parts—Command Module, Service Module, and Lunar Module—has its own story. The technology, the politics, the personal stories—all are detailed and illustrated.

Brosius, Craig A., Janette C. Gervin, and James M. Ragusa. *Remote Sensing and the Earth.* Brevard County, Florida, School Board, 1977. 472pp. B/w photos and diagrams. Glossary. Secondary and adult.

A curriculum supplement for senior high school use oriented toward ecological study of the Earth from higher elevations, prepared as a joint project of Earth resources scientists at NASA's John F. Kennedy Space Center and the science resource teachers of the county around Cape Kennedy. The first section covers the basic physics and technology of remote sensing, with each chapter ending with vocabulary and inquiries. Section Two includes selected readings covering areas in which remote sensing is utilized, for example, agriculture, land use, marine resources. Section Three is a series of "laboratory excursions" intended to develop student skills. Appendixes include sources of remote sensing information.

Brower, Kenneth. *The Starship and the Canoe.* Holt, Rinehart, 1978. LC# 77-15200. Hardcover ISBN 0-03-039196-2. Paperback ISBN 0-553-12451-X from Bantam. 270pp. Secondary and adult.

In this unusual double biography, the author explores the growth and thoughts of two men living disparate lives: astrophysicist Freeman Dyson, who is preoccupied with space (see Dyson: *Disturbing the Universe*), and his son George, who has gone back to the earth, living in a tree house in British Columbia, Canada. The former's story centers around his planning of a nuclear starship called *Orion.* The latter's thoughts revolve around another spectacular, through primitive, vehicle, an ocean-going kayak.

Brown, Joseph E., and Anne Ensign Brown. *Harness the Wind: The Story of Windmills.* Dodd, Mead, 1977. LC# 77-6489. ISBN 0-396-07484-7. 109pp. B/w photos. Intermediate and upper.

Windmills have been used for many centuries. They even helped to build a nation. This book relates their history and shows how they will play an increasingly important role in our lives.

Brown, Peter Lancaster. *Comets, Meteorites and Men.* Taplinger, 19[illegible]. LC# 73-16633. ISBN 0-8008-1734-6. 255pp. B/w photos. Index. Secondary and adult.

Comets and meteors remain ever-fascinating, and this book does a thorough job of relating their nature, the drama of Halley's discovery, other unusual and remarkable comets, and the possibility of exploring these objects in space as they travel through the solar system. Several appendixes contain statistical matter.

________. *Planet Earth in Color.* Macmillan Color series. Macmillan, 1976. LC# 76-7960 ISBN 0-02-567710. 264pp. Color art and photos, b/w diagrams. Index. Bibliography. Secondary and adult.

The story of the Earth, in space, as a planet, how it changes, and as a habitat. A large full-color section includes illustrations referred to in the text. The text covers material learned about other planets and relates it to our knowledge of Earth.

Brown, R. Hanbury. *Man and the Stars.* Oxford, 1978. LC# 78-40237. ISBN 0-19-851001-2. 185pp. B/w photos and drawings. Index. Glossary. Bibliography. Secondary and adult.

The author runs an astronomical observatory in the Australian bush. He has taken his frustration at trying to explain the value of astronomy to civilization and turned it into a pertinent book on the stars and their relevance to our calendar, time, navigation, and the scientific view of the universe, as well as their cultural and religious relevance.

Brown, Seyom, et al. *Regimes for the Ocean, Outer Space and Weather.* Brookings, 1977. LC# 76-51574. Hardbound ISBN 0-8157-1156-5. Paperback ISBN 0-8157-1155-7. 257pp. Index. Adult.

The result of the Technology and International Institutions Project of the Brookings Foreign Policy Studies program, this book explores the growing concern that Earth's resources are not limitless. The study examines the problems of scarcity, an assessment of the possiblities for regulating resource use, and a proposal that new international agencies be established to coordinate the disparate private and government activities affecting the oceans, atmosphere, extraterrestrial space, and weather.

Bruno, Leonard C. *We Have a Sporting Chance: The Decision to Go to the Moon.* US GPO, 1979. Stock no. 030-000-00110-9. 24pp. B/w photos. Bibliography. Secondary and adult.

A booklet based on an exhibition held at the U.S. Library of Congress in 1979, showing memorabilia pertaining to the decision process and the photos, people, and events involved. The exhibit was held on the Tenth Anniversary of the first lunar landing.

Bryan, C. D. B. *The National Air and Space Museum.* Abrams, 1979. LC# 79-1432. ISBN 0-8109-0666-X. 504pp. Color and b/w photos and art. Index. Bibliography. Foreword by Michael Collins, then Undersecretary of the Smithsonian Institution. Upper and up.

In a very brief time the new National Air and Space Museum of the Smithsonian Institution in Washington, D.C., has become the most visited museum in the world. This abundantly illustrated volume shows why as the author carries the reader (or browser) through the exhibit halls and thus through the history of aeronautics and space. A six-foot pull-out panorama depicts the conquest of the skies.

Buckley, Shawn. *Sun Up to Sun Down: Understanding Solar Energy.* An Energy Systems Learning Book. McGraw-Hill, 1979. LC# 79-13955. ISBN 0-07-008790-3. 166pp. B/w photos and art. Secondary and adult.

A clear, nontechnical explanation of what solar energy is and the ways in which it can be collected and stored. The author shoots down the current belief that solar energy is inexpensive and explains the problems and technology that make it costly.

Burgess, Eric. *To the Red Planet.* Columbia, 1978. LC# 78-6911. ISBN 0-231-04392-9. 181pp. B/w photos and diagrams. Index. Secondary and adult.

A thoroughly described and illustrated story of the Viking mission to Mars, starting with the role the Red Planet has played in man's imagination. The people, the spacecraft and instruments, the problems and deliberations are all detailed by a writer who was involved with the project from its beginnings. Because the Viking landings took place, for safety's sake, in what the author calls the "blandlands," he discusses the challenges for the future when more interesting parts of the Martian surface might be explored.

Bursnall, W. J., et al., editors. *Space Shuttle Missions of the 80's.* Vol. 32, Parts I and II, of the AAS Advances in Astronautical Sciences series. AAS, 1977. LC# 57-43769. ISBN Part I 0-87703-078-2; Part II 0-87703-087-1. 1308pp. total. B/w photos and diagrams. Adult.

The Twenty-first Annual Meeting of the American Astronautical Society, held in 1976 in Denver, Colorado, asked: "The Space Transportation System is here. How can we maximize its use for the benefit of mankind?" More than 150 papers were presented by 750 scientists, engineers, political leaders, and industrial users. Thirty are published here in full; the remainder are summarized in a few pages each. Major programs covered include the Large Space Telescope; the atmospheres, magnetospheres, and plasmas in space; the Space Tug and Spacelab; and energy in the Shuttle era. Technical details are kept to a minimum in this foresighted volume.

Butler, S. T., and Robert Raymond. *The Family of the Sun.* Frontiers of Science series. Anchor Press/Doubleday, 1975. LC# 74-33084. ISBN 0-385-09827-8. 84pp. B/w art. Upper and secondary.

Simply written and illustrated in a comic strip format, this book is one of six science titles in a series written and produced by the same authors. It covers our solar system from its very beginnings to exploration of its outer reaches today.

C

Calder, Nigel. *The Comet is Coming: The Feverish Legacy of Mr. Halley.* Viking, 1980. LC# 80-25328. ISBN 0-670-23216-5. 160pp. B/w photos. Index. Bibliography. Secondary and adult.

1985 is coming and with it will come into our solar system that most famous comet of all, Halley's. It was viewed in ancient times and then analyzed as a predictable returning comet in the 1680s. This time around it will be inspected by space scientists and astronomers of the International Halley Watch.

________. *Einstein's Universe.* Viking Press, 1979. LC# 78-26087. Hardcover ISBN 0-670-29076-9. Paperbound ISBN 0-14-005499-5 from Penguin. 176pp. B/w photos and diagrams. Index. Adult.

The author, who also wrote the script for a TV special celebrating Einstein's centenary, wished "to make relativity plain." Einstein's ideas of time, space, and motion are presented in the light of today's knowledge which has confirmed Einstein's seemingly visionary ideas.

________. *The Key to the Universe: A Report on the New Physics.* Viking Press, 1977. LC# 76-51766. Hardcover ISBN 0-670-41270-8. Paperbound ISBN 0-14-005065-5 from Penguin. 200pp. Color and b/w photos, diagrams. Index. Bibliography. Secondary and adult.

An exploration of philosophical questions as viewed by the physicists: What are the meanings of space, time, distance? How did the universe come into being? How will it end? Are we alone in the universe? In a nontechnical book based on a BBC-TV series, Calder clarifies not only the breakthrough discoveries—black holes, quarks, evidence that the forces of nature may be a single process in different guises—but also the broader implications of these discoveries which reveal a new and welcome perspective on mankind's place in the universe.

________. *Spaceships of the Mind.* Viking Press, 1978. LC# 78-14415. Hardcover ISBN 0-670-66021-3. Paperback ISBN 0-14-005231-3 from Penguin. 144pp. Color photos, b/w photos and diagrams. Index. Secondary and adult.

Based on a three-part BBC-TV series, this thoughtful book explores "big ideas" in science—their influence on society in the past and their potential in our future. Using space technology as the central image, the author introduces some of the big ideas of today and their originators in such subjects as rearranging the materials of the solar system for mankind's benefit, space colonization, improvements on Earth, making use of asteroids and other planets, interstellar politics, and extraterrestrial life.

Calvin, Melvin, and Oleg G. Gazenko, general editors. *Foundations of Space Biology and Medicine.* NASA SP-374. US GPO, 1976. Adult.

Vol. 1: *Space as a Habitat.* Stock no. 3300-00605-5. 464pp.

Vol. 2: *Ecological and Physiological Foundations of Space Biology and Medicine.* Part I: Stock no. 3300-00606-3. 416pp. Part II: Stock no. 3300-00607-1. 360pp.

Vol. 3: *Space Medicine and Biotechnology.* Stock no. 3300-00608-0. 552pp.

This four-book paperbound set (actually, three volumes with Volume II in two parts) is the joint US-USSR summary of the biological and medical results of the first fifteen years of spaceflight. Nineteen of the forty-five chapters are by American scientists, twenty by Soviet scientists, and six by two-nation teams. In general, while quite technical in nature, these books are worth pursuing by the interested layperson because they will be the standard references in the field of space medicine in the years and space adventures to come.

Cannon, Robert L. *The Laws of Motion and Model Rocketry.* Estes, 1972. 12pp. B/w art. Intermediate and up.

A collection of articles that first appeared in *Model Rocket News,* pertaining to the three Laws of Motion. They are just as relevant to model rockets as they are to the real thing. Useful illustrations and self-tests augment the text.

________. *A Learning Guide for Model Rocket Launch Systems.* Revised edition. Estes, 1976. 19pp. B/w photos and art. Intermediate and up.

The launch system for model rockets accomplishes two tasks: it holds the rocket before and during launch, and it provides the electrical power to ignite the rocket's engine. This pamphlet introduces the basics of electrical circuits and mathematics with text reinforced by well-chosen questions.

________. *Projects in Model Rocketry.* Estes, 1974. 12pp. B/w photos and art. Intermediate and up.

Developed primarily as a project guide for the Estes Aerospace Clubs, this booklet introduces young modelers to the classic experimentation method, encouraging them to plan, observe, record, and report details of studies in such areas as acceleration, recovery, telemetry, drag, stability, and altitude calculation.

Carpenter, Donald G., editor. *Environmental Space Sciences.* Whitehall, 1972. LC# 77-161081. ISBN 0-87655-022-7. 720pp. B/w photos and diagrams. Index. Adult.

A textbook dealing with the entire realm of space, from the surface of the Earth outward. This introductory text covers such areas as the Sun, between Sun and Earth, our planet's atmosphere, radio exploration, the planets and their satellites, extraterrestrial life, and radiation in space.

Caveney, Sylvia, and Rosemary Giesen. *Where Am I?* A First Fact Book. Lerner, 1977. LC# 76-22476. ISBN 0-8225-1365-X. 24pp. Color art by Simon Stern and Rosemary Giesen. Primary.

A brief, colorful book locating a young reader in his room, street, town, and on to the universe.

Center for Aerospace Education Development. *Aerospace: The Challenge.* Civil Air Patrol, 1979. 559pp. Two-color photos and art. Index. Secondary.

An aerospace education textbook for the high school level developed by the Civil Air Patrol to prepare young people to live as responsible citizens of a major aerospace power. The well-illustrated book is divided into six major sections: 1) The Heritage of Flight, 2) The Aerospace Environment, 3) Principles of Aircraft Flight and Navigation, 4) Aerospace Vehicles, 5) Rocketry and Space, and 6) The Aerospace Community. Each chapter concludes with a list of "terms to remember." An Instructor's Guide and a Student Workbook are available with the textbook.

________. *Dr. Robert H. Goddard: A Single Concept Learning Packet.* Aerospace Personality series #017. Civil Air Patrol. B/w art. Intermediate and upper.

The complete story of the "father of American rocketry" and the work he accomplished in rocketry development are studied in a variety of ways and in several different curriculum areas. The packet includes instructor's guide, wall posters, multidisciplinary student task cards, tests, bibliography, materials list, and suggested activities for grades 3 through 7.

________. *4 in 1 Aerospace Coloring Books: Book 1 and Book 2.* Civil Air Patrol. 20pp. each. B/w art. Primary.

Introduces in colorable, cartoon-style art the basic concepts of aerospace science. Book 1 deals with the idea of lighter than air, gravity, clouds, and weather. Book 2 shows the development of flight, aerospace careers, navigation, and air at work.

________. *Space Shuttle: A Single Concept Learning Packet.* Space Exploration series #020. Civil Air Patrol.

An instructional packet introduces the Shuttle Space Transportation System, its structure and its missions. The packet includes instructor's guide, wall posters, multidisciplinary student task cards, tests, a bibliography, materials list, and suggested activities for grades 3 through 7.

________. *Space Shuttle: A Space Transportation System.* Aerospace Learning Activity Booklet #004. Civil Air Patrol. 20pp. B/w art. Intermediate.

A booklet for learning through activities that introduce the Space Shuttle structure and its basic mission. The puzzles, games, and coloring activities involve all major curricular areas.

Center for War/Peace Studies. *Teaching about Spaceship Earth.* Intercom #71. 1972; distributed by Association for Childhood Educational International. 68pp. B/w art. Adult.

Produced in cooperation with the U.S. Committee for UNICEF, this booklet presents a role-playing experience for the middle grades. It challenges young students to see our Earth as a single, finite spaceship whose components are totally interdependent. Earth becomes a self-contained spaceship, *Terra II,* with the students playing the roles of crew, technicians, shopkeepers, and passengers. Each must make decisions that will affect the resources, and inevitably the rights, of the many.

Chander, Romesh, and Kiran Karnik. *Planning for Satellite Broadcasting: The Indian Instructional Television Experiment.* No. 78 in Reports and Papers on Mass Communication. UNESCO, 1976. ISBN 92-3-101392-0. 72pp. Adult.

A thorough description of the preparation that went into SITE, the Satellite Instructional Television Experiment, carried out in India in 1975-76. The satellite was provided by NASA but everything else was the work of the Indian government, which needed to see how best to use communication satellites to improve the public education and information of its vast citizenry.

Chandler, David L. *Life on Mars.* Dutton, 1979. LC# 78-16656. ISBN 0-525-14560-5. 212pp. B/w photos and drawings. Index. Secondary and adult.

Working from a solid base of the science of life on Earth and the genuine discoveries made through the Viking landings on Mars, the author speculates on the possibilities of as-yet-discovered life on our neighboring planet. His major proposal is that the three-sided pyramidal structures found on the Elysium Plateau of Mars might be artifacts made by intelligent beings.

Shapman, Clark R. *Inner Planets: New Light on the Rocky Worlds of Mercury, Venus, Earth, the Moon, Mars and the Asteroids.* Scribners, 1977. LC# 76-58915. ISBN 0-684-14898-6. 170pp. B/w photos. Index. Adult.

The terrestrial planets and the smaller bodies nearby in our solar system are quite similar in composition, density, and size. They have been closely investigated through various probes of the space program. A planetologist looks at NASA-derived information and what it has contributed to our knowledge of the planets, as well as to the process of science in general.

Chapman, Robert D. *Discovering Astronomy.* Freeman, 1978. LC# 77-16024. Hardcover ISBN 0-7167-0034-3. Paperback ISBN 0-7167-0033-6. 518pp. Color and b/w photos and drawings. Index. Glossary. Instructor's Guide available. Adult.

The author, an astronomer with the NASA Goddard Space Flight Center, explores general astronomy from the viewpoint of man's learning of the universe—from objects close up and obvious, to more distant objects seen through telescopes, and then to the outer reaches of the universe, as perceived through a number of different portions of the electromagnetic spectrum. Each chapter of this nontechnical, introductory textbook concludes with review questions.

Chayes, Abram, et al. *Satellite Broadcasting.* Royal Institute of International Affairs series. Oxford, 1973. ISBN 0-19-214994-6. 160pp. Bibliography. Adult.

A four-nation study, conducted in 1970, from the International Broadcast Institute, investigated the legal questions arising from international satellite communications, especially television broadcasting. The introduction makes it clear that technical and legal development will be directed toward a series of regional networks rather than an oft-proposed worldwide broadcasting system. Participants in the study were French, Japanese, British, and American.

Cheremisinoff, Nicholas P. *Fundamentals of Wind Energy.* Ann Arbor Science, 1978. LC# 78-51051. Hardcover ISBN 0-250-40255-6. Paperback ISBN 0-250-40243-2. 170pp. B/w diagrams. Index. Glossary. Secondary and adult.

A straightforward overview of wind energy potential, the history of efforts to utilize it, basic factors in wind energy generation today, the meteorology involved, and current research. The mathematics is kept simplified and no technical background is required. An appendix includes conversion factors for all measurements.

Cheremisinoff, Paul N., and Thomas C. Regino. *Principles and Applications of Solar Energy.* Ann Arbor Science, 1978. LC# 78-50308. ISBN 0-250-40247-5. 249pp. B/w photos and diagrams. Index. Glossary. Adult.

A basic book requiring some technical and mathematical ability to handle the science of solar applications. Includes wind energy and ocean thermal power, as well as biological and chemical conversion of solar energy. The book starts with a brief historical survey and includes tables of solar energy striking inclined surfaces at various latitudes.

Chester, Michael. *Let's Go On a Space Shuttle.* Let's Go series. Putnam, 1976. LC# 76-9652. Trade ISBN 0-399-20470-9. Library binding ISBN 0-399-60960-1. 48pp. Two-color art by Albert Micale. Glossary. Intermediate.

An imaginary journey on a Space Shuttle mission to place in orbit an observatory that will seek information about the stars. The mechanics of the journey and life aboard the craft are described simply. A list of things to think about while reading the book play a role in the descriptions of the launch, opening the cargo bay, releasing a satellite, and the return to Earth.

________. *Let's Go to the Moon.* Revised edition. Let's Go series. Putnam, 1974. LC# 72-79532. ISBN 0-399-60802-8. 48pp. Two-color art by Albert Micale. Glossary. Bibliography. Intermediate.

A straightforward description of a journey to the Moon aboard an Apollo spacecraft, directed at the young reader as an astronaut making a "routine" trip. Includes a great deal of what has been learned about the Moon in recent years as well as some speculation on future utilization of our natural satellite. Thoughtful questions and suggestions for activities are included.

Cheston, T. Stephen, and David C. Webb, editors. *Space Humanization Series.* Institute for the Social Science of Space, 1979. ISBN 0-934144-01-X. 125pp. Adult.

This volume begins a series that represents a concerted effort by the Institute for the Social Science of Space to "stimulate social science and humanities scholarship and reflection on space related topics." This first volume deals with such topics as space industrialization, public policy, privacy in space as a conflict of interest, and space agriculture.

Cheston, T. Stephen, and David L. Winter, editors. *Human Factors of Outer Space Production.* AAAS Selected Symposium #50. Westview, 1980. LC# 79-24648. ISBN 0-89158-789-6. 206pp. Adult.

A record of a symposium of the 1979 American Association for the Advancement of Science Annual Meeting in Houston. The major subject areas discussed were psychological considerations, need for privacy, machine design, food requirements, agricultural systems for large space habitats, and economic factors of outer space production. Each paper concludes with its own bibliography.

Christian, James L., editor. *Extra-Terrestrial Intelligence: The First Encounter.* Prometheus Books, 1976. LC# 76-25328. ISBN 0-87975-063-4. 303pp. B/w photos and diagrams. Bibliography. Secondary and adult.

A collection of essays, mostly original for this volume, pondering the implications of life elsewhere in the universe. Ray Bradbury, Isaac Asimov, George Abell, and Leonard Nimoy are among the contributors.

Cipriano, Anthony. *America's Journeys into Space: The Astronauts of the United States.* Messner, 1979. LC# 79-10254. Hardcover ISBN 0-671-33020-9. Paperbound ISBN 0-671-33033-0. 210pp. B/w photos, portraits by William Joffe Numeroff. Glossary. Foreword by Gordon Cooper. Upper and up.

Much of the American space program, especially the part that caught the public's imagination, has involved men traveling into space. This unusual book records the work of all of America's space-traveling astronauts through projects Mercury, Gemini, Apollo, and Skylab, finishing with the joint US-USSR Apollo-Soyuz flight. The text tells their stories, the photos convey their journeys, and Numeroff's portraits reveal their characters. A helpful list at the end of the volume shows what museums exhibit the various manned spacecraft.

Ciupik, Larry A. *The Universe.* Read About series. Raintree, 1978. LC# 77-27567. ISBN 0-8393-0089-1. ISBN 48pp. Color art. Index. Glossary. Primary.

The structure and movement of the Earth, Moon, planets of the solar system, and beyond, are described and illustrated. Space equipment is shown as are the major features of the universe and how we study them. In addition, the author introduces the metric system and gives conversions.

Ciupik, Larry A., and James A. Seevers. *Space Machines.* Raintree, 1979. LC# 78-26991. ISBN 0-8172-1325-2. 32pp. Color photos and art. Index. Glossary. Primary.

Introduces young readers to the mechanics involved in operating such space "machines" as satellites, planetary probes and landers, Skylab, and the Space Shuttle. Each is given a large picture and brief text.

Clark, John D. *Ignition! An Informal History of Liquid Rocket Propellants.* Rutgers, 1972. LC# 72-185390. ISBN 0-8135-0725-1. 214pp. Index. Foreword by Isaac Asimov. Secondary and adult.

For anyone who asks why we use the fuels we do to reach space, here are some answers—the crackpots, the accidents, the smells and the smokes, all in an unusual, nontechnical look at space exploration history.

Clarke, Arthur C. *Profiles of the Future: An Inquiry into the Limits of the Possible.* Revised edition. Harper & Row, 1973. LC# 72-6714. Hardcover ISBN 0-06-010792-8. Paperbound ISBN 0-445-04061-0 from Popular Library. 237pp. Secondary and adult.

The well-known science and science fiction writer updates his 1962 volume because "the future has since become respectable." In a collection of essays, he discusses such subjects as future transportation modes, gravitation, speed and distance, and the uses of space.

________. *Report on Planet Three and Other Speculations.* Harper & Row, 1972. LC# 74-156515. Hardcover ISBN 0-06-010793-6. Paperbound ISBN 0-451-07864-0 from New American Library. 250pp. Secondary and adult.

A collection of both light-hearted and serious essays, starting with a report, supposedly by a Martian scientist, speculating on the possibility of life on planet Earth ("he" finds it to be unlikely). Several of the essays were written before the space program began but are interesting for the predictions they contain. Others contain a new series of predictions along with discussions of the technological aspects of our lives.

________. *The View from Serendip.* Random House, 1977. LC# 77-5989. Hardcover ISBN 0-394-41796-8. Paperbound ISBN 0-345-27108-4 from Ballantine. 275pp. Secondary and adult.

A collection of reminiscent essays containing the author's three major interests: space, the sea, and Sri Lanka (formerly called Ceylon and the even older name of Serendip), where he makes his home. The space subjects include the beginning of the Space Age, spinoffs from the space program, the movie *2001: A Space Odyssey,* the flight of Apollo 11, the Indian Satellite Instructional Television Experiment (SITE), and his appearances before the U.S. House of Representatives Committee on Space Science and Applications to testify on ideas for future space programs.

________. *Voice Across the Sea.* Revised edition. Harper & Row, 1975. LC# 74-15817. ISBN 0-06-010782-0. 228pp. B/w photos. Index. Secondary and adult.

The first edition of this book was published in 1958 as a recognition of the centenary of the laying of the first Atlantic telephone cable. Quite soon after that the end of the cable communications era came into sight when the first passive reflecting satellite was launched in 1960. A few years later the first synchronous satellite system, first proposed by the book's author in 1944, was in place and working. This book explores the old and the new in transatlantic communications.

Clayton, Donald D. *The Dark Night Sky: A Personal Adventure in Cosmology*. A Demeter Press Book. Quadrangle/New York Times, 1975. LC# 75-9213. ISBN 0-8129-0585-7. 206pp. B/w photos. Foreword by Fred Hoyle. Secondary and adult.

A cosmologist introduces contemporary scientific ideas of the universe, as he learned them through his own life, describing, as Fred Hoyle says, "what it is that drives the scientist helter-skelter along a road nobody except himself and perhaps a few colleagues can perceive at all."

Clotfelter, Beryl E. *The Universe and Its Structure*. McGraw-Hill, 1976. LC# 75-6714. ISBN 0-07-011385-8. 437pp. B/w photos and diagrams. Index. Bibliography. Adult.

A textbook for the nonscience college student, emphasizing the *process* of science, specifically astronomy, rather than a static body of knowledge. It gives special importance to understanding by laypersons of the implications of such topics as quasars, black holes, extraterrestrial life, and radiation. Each chapter ends with questions. Appendixes include constants and nomenclature. A Teacher's Manual is available.

Cloud, Preston. *Cosmos, Earth and Man: A Short History of the Universe*. Yale, 1978. LC# 78-2666. Hardcover ISBN 0-300-02146-1. Paperbound ISBN 0-300-02594-7. 372pp. B/w drawings. Index. Adult.

An unusual book by a biogeologist that distills the entire known story of the evolution of the universe, the condensing of matter into our solar system, and the development of life on Earth. He concludes with our efforts to expand beyond Earth and projects a possible future based on our current technology. Many very complex events, processes, and relationships are placed within the grasp of the layperson. Each chapter concludes with suggestions for further reading.

Cobb, Vicki. *Super Suits*. Lippincott, 1975. LC# 74-19083. Hardcover ISBN 0-397-31559-7. Paperbound ISBN 0-397-31609-7. 96pp. B/w art by Peter Lippman. Index. Intermediate.

Super suits are those clothing items that protect people from extremes of cold, fire, water, high altitudes, and, finally, space. A great deal of information about people, physics, and geography is packed into this book.

Colby, C. B. *Space Age Spinoffs: Space Program Benefits for All Mankind*. Coward, McCann, 1972. LC# 72-80862. Trade ISBN 0-698-20222-8. Library binding ISBN 0-698-30420-9. 48pp. B/w photos. Intermediate.

A look at some of the real and practical developments for use on Earth that evolved from the space program, covering such areas as medical care, transportation, food, and industrial tools, in large photos with short, explanatory captions.

Cole, Franklyn W. *Fundamental Astronomy: Solar System and Beyond*. Wiley, 1974. LC# 73-12146. Hardcover ISBN 0-471-16472-0. Paperbound ISBN 0-471-16473-9. 476pp. B/w photos and diagrams. Index. Glossary. Adult.

An introductory college text for liberal arts or education majors. Freely illustrated with apt NASA photos, this book concentrates more heavily on the solar system than many astronomy textbooks do. Each chapter concludes with review questions.

Cole, G. H. A. *The Structure of Planets*. Wykeham Science series. Crane, Russak, 1978. LC# 77-18646. Hardcover ISBN 0-85109-610-7. Paperbound ISBN 0-85109-600-X. 232pp. B/w photos and diagrams. Index. Bibliography. Adult.

An introduction to planets and the general principles under which they were formed, the characteristics of their materials, and their interaction. The second half of this semitechnical book details more closely each of the planets in our solar system, especially enhanced by the new knowledge acquired through the space program.

Collins, Michael. *Carrying the Fire: An Astronaut's Journeys*. Farrar, Straus, 1974. LC# 74-7211. Hardcover ISBN 0-374-11917-1. Paperbound ISBN 0-345-24560-1 from Ballantine. 483pp. B/w photos. Foreword by Charles A. Lindbergh. Secondary and adult.

The osyssey of one pilot-turned-astronaut, from his first experiences with flight through the preparation in Project Gemini for going to the Moon, to the complete and candid personal-view detail of our first journey to the Moon, through the eyes of the astronaut who stayed aboard the Apollo Command Module while others walked the lunar surface.

_______. *Flying to the Moon and Other Strange Places*. Farrar, Straus, 1976. LC# 76-25496. ISBN 0-374-32412-3. 160pp. B/w photos. Intermediate and upper.

The Apollo 11 astronaut retells for young people the story of his own adventures as a test pilot, aboard Gemini 10, and as Command Module Pilot on the Apollo 11 Moon flight. In addition, he describes a journey aboard a Space Shuttle, to Mars, aboard a space colony, and even beyond our solar system.

Cooke, Hereward Lester, with James D. Dean. *Eyewitness to Space*. Abrams, 1971. LC# 76-141761. ISBN 0-8109-0112-9. 227pp. Color art. Foreword by J. Carter Brown, Director of the National Gallery of Art. Preface by Thomas O. Paine, Former Administrator, NASA. All ages.

In 1963 NASA began a program to create artistic impressions of the Space Age because the camera alone seemed inadequate. This one-of-a-kind volume includes 258 paintings, drawings, and prints by 47 artists and presents a new view of the activity involved in the manned spaceflight program from 1963 to 1970. Introductory sections provide straightforward explanations of the program, while explanatory captions appear with the pictures when required by the nature of the pictures.

Coombs, Charles. *Passage to Space: The Shuttle Transportation System.* Morrow, 1979. LC# 79-1176. Trade ISBN 0-688-22194-7. Library binding ISBN 0-688-32194-1. 128pp. B/w photos and art. Index. Glossary. Intermediate.

The Space Shuttle, its uses, its value and potential, explored in photographs and text. The full range of jobs it can do in space is described, as is its potential for playing a role in such future activities as space colonization and industrialization.

_______. *Skylab.* Morrow, 1972. LC# 79-16871. ISBN 0-688-31812-6. 128pp. B/w photos and diagrams. Index. Intermediate and upper.

Although published before the actual Skylab missions began, this book usefully describes the Skylab space station structure, instrumentation, and mission. A concluding chapter regards Skylab as a trailblazer and looks ahead to other space stations and the Space Shuttle.

Cooper, Henry S. F., Jr. *A House in Space.* Holt, Rinehart, 1976. LC# 75-42991. ISBN 0-03-016686-1. 184pp. B/w photos, color diagrams. Secondary and adult.

May 14, 1973, through February 8, 1974—for less than nine months, Skylab, the first long-term space station, was inhabited by three crews of astronauts for up to ninety days at a time. In this book derived from *New Yorker Magazine* articles written during Skylab's active period, life aboard the station is detailed, the scientific investigations and findings described, and the personalities and problems of the men themselves explored.

_______. *The Search for Life on Mars.* Holt, Rinehart, 1980. LC# 79-20061. ISBN 0-03-046166-9. 254pp. Index. Secondary and adult.

This unusual look at the Viking landings on Mars begins with a portrait of Carl Sagan, the planetary astronomer whose views on the possibilities of life elsewhere in space are most widely discussed. Then other principal scientists on Viking are introduced and their united work with the Martian research described. It is a picture of scientists of the far-out hard at work on Earth.

_______. *Thirteen: The Flight that Failed.* Dial, 1973. LC# 72-13676. ISBN 0-8037-8765-0. 199pp. Secondary and adult.

The dramatic, step-by-step telling of the near-tragic explosion and successful return to Earth of Apollo 13.

Cornell, James, and E. Nelson Hayes, editors. *Man and Cosmos: Nine Guggenheim Lectures on the Solar System.* Norton, 1975. LC# 75-6687. ISBN 0-393-06402-6. 191pp. B/w photos. Secondary and adult.

A 1972 series of lectures by prominent astronomers. The book's introduction serves, where necessary, to update specific information in the lectures. The speakers and their subjects were: History of the Solar System, A. G. W. Cameron; The Sun, Owen Gingerich; The Moon, John A. Wood; The Planets, Carl Sagan; Planetary Atmospheres, S. I. Rasool; The Outer Planets, John S. Lewis; Asteroids, Myron Lecar; Comets, Brian G. Marsden; and Perspectives: Past, Present and Future, Fred L. Whipple.

Cornish, Edward, editor. *1999: The World of Tomorrow.* World Future Society, 1978. LC# 78-17612. ISBN 0-930242-04-1. 160pp. B/w photos and drawings. Secondary and adult.

Selections from *The Future: A Journal of Forecasts, Trends, and Ideas about the Future* make up a paperbound volume that views the future as a time illuminated by the past, as a time of technological progress in many areas, as a challenge that we must face in philosophical and educational terms, and finally as a time that we can "invent" through active, creative decision-making.

Cortright, Edgar M., editor. *Apollo Expeditions to the Moon.* NASA SP-350. US GPO, 1976. Stock no. 3300-00630-6. LC# 75-600071. 313pp. Color and b/w photos. Index. Secondary and adult.

In the introduction to this fascinating book, Robert C. Seamans, Jr., former Deputy Administrator of NASA, writes, "From the first step of a man onto the Moon in Apollo 11 to the last departing step in Apollo 17, we showed that enormously difficult large endeavors can succeed, given the willingness, discipline, and competence of a dedicated crew of gifted people." This heavily illustrated and well-captioned book was created by the "gifted people" most directly involved in each phase. For example, Wernher von Braun wrote the chapter on creating the Saturn rockets. Rocco Petrone described the "moonport" at Cape Kennedy. The astronauts cover the specific flights in which they were concerned. An excellent pictorial history of a one-of-a-kind venture.

Couper, Heather, and Nigel Henbest. *Space Frontiers.* Viking, 1978. LC# 78-6180. ISBN 0-670-65954-1. 60pp. Color photos and art. Index. Glossary. Intermediate and upper.

An illustrated look into the future in space: exploration of the planets, colonies, astronomical research. The basics of Earth in space and rocketry principles are presented as well as the possibilities for the future. Experiments and activities for understanding are included in boxes throughout the pages.

Cousins, Norman, et al. *Why Man Explores.* NASA EP-123. US GPO, 1977. Stock no. 3300-00672-1. 94pp. B/w photos. Upper and up.

Transcript of a symposium held July 2, 1976, in conjunction with the Viking landing on Mars and moderated by Norman Cousins, editor of *Saturday Review.* The panel's participants were Captain Jacques Cousteau, explorer-oceanographer; James Michener, explorer-author; Dr. Philip Morrison, physicist; and Ray Bradbury, author.

Cromie, William J. *Skylab: The Story of Man's First Station in Space.* McKay, 1976. LC# 74-25983. ISBN 0-679-20300-1. 146pp. B/w photos. Index. Upper and secondary.

The author of this thoroughly illustrated book for young people lived the day-to-day activities of Skylab as they were seen at the NASA Johnson Space Center in Houston and relayed to him by the astronauts. The work and play of the men are detailed, their discoveries described, their frustrations and pleasures shared.

Cross, Charles A., and Patrick Moore. *The Atlas of Mercury*. Crown, 1977. LC# 76-53141. ISBN 0-517-531232. 48pp. B/w photos and drawings. Foreword by Sir Bernard Lovell. Adult.

The tiny planet about which little was known and the guesses made were usually inaccurate is here revealed in detail for the first time. The historical guesses and new discoveries are explained in nontechnical terms by a planetary map-maker and eminent astronomer-writer. The photographer was NASA's Mariner 10 space probe which made three fly-by visits to Mercury in 1974 and 1975.

Culver, Roger B. *Astronomy*. Barnes & Noble Outline series. Harper & Row, 1979. LC# 78-15832. ISBN 0-06-460158. 295pp. Index. Glossary. Secondary and adult.

A brief, not-too-technical compact summary of the basic information of astronomy, designed to be compatible with all the major textbooks. It follows the traditional pattern of history, techniques, solar system, stars, galaxies, and cosmology. Each chapter concludes with review questions. Star charts and a very comprehensive glossary are presented at the end.

Cunningham, Walter. *The All-American Boys*. Macmillan, 1977. LC# 77-22721. ISBN 0-02-529240-4. 321pp. Index. Secondary and adult.

This is a personal account by a former astronaut who joined the group in 1963, flew the Apollo 7 mission, and left NASA in 1971. He was determined "to share the enthusiasm and skill we brought to our work as well as to tell about the warts and moles which sometimes compromised it."

Cutler, Michael, editor. *International Cooperation in Space Operations and Exploration*. Vol. 27 in the AAS Science and Technology series. AAS, 1971. ISBN 0-87703-058-3. 182pp. B/w diagrams. Adult.

Proceedings of the Ninth Goddard Memorial Symposium held in 1971 in Washington, D.C., dealing with the importance of international cooperation in space as well as detailing the programs that were, at that time, already a matter of international involvement, such as communications satellites, Earth resources survey, and advanced air traffic control.

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Dale, Alvin E., and William L. Newman. *Steps to the Moon*. U.S. Dept. of Interior Geological Survey, 1980. Available from US GPO. Stock no. 1980-311-348/31. 16pp. B/w photos and drawings. Upper and up.

A small booklet describing the process of going to the Moon: how we got closer for better, more detailed photographs, then made robot landings, and finally how men walked its surface. Photos show and explain close-up details of the surface. The U.S. Geological Survey now has responsibility for American astrogeology.

Daniloff, Nicholas. *The Kremlin and the Cosmos*. Knopf, 1972. LC# 79-171136. ISBN 0-394-47493-7. 269pp. B/w photos. Index. Bibliography. Adult.

The history, as seen by an outsider, of the Soviet space program from the launch of Sputnik I on October 4, 1957. The story is traced from the background of its early beginnings to the development of cooperative US-USSR programs in the early 1970s. The author points out that the Soviets never announced that they would try to land men on the Moon, but after the success of Apollo 8 they emphasized the advantages of unmanned exploration.

Darden, Lloyd. *The Earth in the Looking Glass*. Anchor Press/Doubleday, 1974. LC# 73-9151. ISBN 0-385-02595-5. 324pp. B/w photos. Index. Secondary and adult.

A nontechnical and readable exploration of the techniques of remote sensing and how our sight is being extended through the use of various wavelengths, particularly by the Landsat satellites. Episode after episode of the uses made of the satellite in its early years are detailed to show the broad range of applications—social, scientific, industrial, agricultural.

Davidoff, Martin R. *Using Satellites in the Classroom: A Guide for Science Education*. Catonsville Community College, 1978. 238pp. B/w photos and diagrams. Glossary. Adult.

An educator's guide, developed under a research grant from the National Science Foundation, to show how space satellites can be presented in the classroom. It also provides complete information on assembling a satellite ground station suitable for live classroom demonstrations and hands-on student exercises using AMSAT-OSCAR satellites.

Davies, Merton E., et al. *Atlas of Mercury*. NASA SP-423. US GPO, 1978. Stock no. 3300-00695-1. 125pp. B/w photos. Adult.

Drawn from the photos of only one side of the innermost planet, taken during the flyby of Mariner 10, this partial atlas shows, the authors say, "not a beautiful face . . . nevertheless a most fascinating one, marked with a character all its own."

Davies, Merton E., and Bruce C. Murray. *The View from Space: Photographic Exploration of the Planets.* Columbia, 1971. LC# 75-168867. Hardcover ISBN 0-231-03557-8. Paperbound ISBN 0-231-08330-0. 163pp. B/w photos. Index. Adult.

In this book sponsored by the Rand Corporation, the authors contend that much of the impact of space on mankind is not the practical benefits so much as the "impact—through photography—upon the minds of men." We must adjust and grow in response to the new visions of our world. A basic introduction to photography is provided as a base for understanding the pictures of early planetary research and projections into the future.

Davies, P. C. W. *Space and Time in the Modern Universe.* Cambridge, 1977. LC# 76-27902. Hardcover ISBN 0-521-21445-9. Paperback ISBN 0-521-29151-8. 232pp. B/w diagrams. Index. Adult.

Our ideas of space and time in physics have undergone dramatic change in recent years in light of such astronomical possibilities as black holes and the "Big Bang" origin of the universe. Even our conception of humanity's place in the universe plays a role in this physical discussion meant for nontechnical and nonmathematical students.

Davies, Paul. *The Runaway Universe.* Harper & Row, 1978. LC# 78-2128. Hardcover ISBN 0-06-010971-8. Paperbound ISBN 0-14-005366-2 from Penguin. 205pp. B/w photos. Index. Adult.

An exploration of the common factor of all physical systems: organization as derived from the "Big Bang" and the emerging universe. In addition, the author projects alternative futures of obliteration ("stardoom") of the universe or a supertechnology that will allow intelligent beings to survive catastrophe.

Dean, Anabel. *Up, Up, and Away! The Story of Ballooning.* Westminster, 1980. LC# 79-23427. ISBN 0-664-32658-7. 192pp. B/w photos. Index. Glossary. Bibliography. Intermediate and upper.

An easy-to-read history of the balloon through the crossing of the Atlantic in 1978. Concluding chapters discuss the future of large, workhorse blimps, balloons serving as cranes, and special balloons in space.

DeCallatay, Vincent, and Audouin Dollfus. *Atlas of the Planets.* U. of Toronto, 1974. LC# 71-185706. ISBN 0-435-54140-4. Color and b/w photos, diagrams. Adult.

A fully illustrated textbook-travelogue of our solar system by two European astronomers, itemizing what was known about the planets up to 1974. It begins with the history of planetary astronomy and continues in a very human, nontechnical fashion.

Degani, Meir H. *Astronomy Made Simple.* Revised edition. Doubleday, 1976. LC# 76-2836. ISBN 0-385-08854-X. 228pp. B/w diagrams. Index. Glossary. Secondary and adult.

A straightforward explanation of the universe and its components, broken into "bite-sized" pieces. The information has been updated to publication time so that considerable space program material is included. Problems for the reader to solve are scattered throughout.

DeNevi, Don. *To the Edges of the Universe: Space Exploration in the 20th Century.* Celestial Arts, 1978. LC# 77-90005. Hardcover ISBN 0-89087-184-1. Paperbound ISBN 0-89087-212-0. 214pp. B/w photos. Index. Glossary. Bibliography. Secondary and adult.

A nontechnical exploration of the ideas developed both inside and outside the space program for human travel outward into the universe. After a brief background survey, the author investigates methods of occupying space, colonizing other nearby planets, and exploring the distant reaches of the solar system.

Dennis, Landt. *Catch the Wind: A Book of Windmills and Windpower.* Four Winds Press, 1976. LC# 75-45002. ISBN 0-590-07414-8. 114pp. B/w photos. Index. Intermediate and upper.

An historical and current look at utilization of the wind—for ships, grinding corn, draining the wetlands of The Netherlands, and finally for generation of electricity. Numerous contemporary photos show the interesting variety of windmills in use today.

DeRoussan, Jacques. *Beyond the Sun: Au Dela Du Soleil.* Astronomy for Children series. Tundra, 1972. LC# 76-179432. ISBN 0-912766-52-2. 28pp. Color art by the author. Primary.

A Canadian two-language book about a boy who dreams that he makes a very brief journey by rocket out into the universe.

________. *If I Came from Mars: Si J'étais Martien.* Astronomy for Children series. Tundra, 1977. LC# 76-58700. ISBN 0-912766-53-0. 28pp. Color art by the author. Primary.

Peter dreams—both in English and in French—that he is an Earthling born on Mars making a journey through space to view his ancestral planet. He sees the Moon, a comet, the land, weather, and oceans on Earth. He also sees the plants, animals, and people. He must return to Mars, but now he finds it a barren, lonely place.

Deutsch, Keith. *Space Travel in Fact and Fiction.* Fact and Fiction series. Watts, 1980. LC# 80-14483. ISBN 0-531-04156-5. 86pp. B/w photos. Index. Bibliography. Intermediate and upper.

Today's reality was the science fiction of twenty-five years ago. Today's fiction, such as "Star-Trek," may or may not become the reality of tomorrow. This book presents a history of space fiction becoming fact and the probabilities for the future.

Devinney, Edward J., Jr., Haywood Smith, Jr., and Sabatino Sofia. *Contemporary Astronomy.* Physical Science series. Merrill, 1975. LC# 74-27269. ISBN 0-675-08727-9. 342pp. Color and b/w photos, diagrams. Index. Adult.

An introductory textbook for nonscience majors, a bit simpler than many other textbooks and organized in traditional fashion. Part 1 covers history and the basic practices of astronomy. Part 2 describes planets and stars, and Part 3 deals with galactic astronomy and cosmology. Each chapter concludes with a series of questions. The end sheets are star charts.

Diagram Group. *Spaceship Earth: Its Voyage through Time.* A Science Digest Book. Hearst Books, 1980. LC# 80-81712. ISBN 0-87851-205-5. 64pp. Color art. Index. Secondary and adult.

A save-our-Earth book emphasizing that our planet is just one tiny speck in a vast universe of galaxies. It illustrates the history, geologically and biologically, of our speck, shows how mankind has inhabited it, used and abused it, and now escaped its grip into space where we can look back and see that our planet must be treated with greater respect.

Dicerto, Joseph J. *From Earth to Infinity: A Guide to Space Travel.* Messner, 1980. LC# 80-12812. ISBN 0-671-33017-9. 320pp. B/w photos and art. Index. Upper and up.

Here is the whole story of space exploration—the history, the science, the reasons, the programs, and the future. Technology, problems of manned space flight, spinoffs for earthly benefit, even the whole universe beyond us are among topics covered in this comprehensive book.

Dickson, Paul. *Out of This World: American Space Photography.* Delacorte, 1977. LC# 77-21740. ISBN 0-440-06568-2. 158pp. Color and b/w photos. Foreword by R. Buckminster Fuller. Upper and up.

An unusual view of the space program, concentrating on the photography derived from it. The beauty and usefulness of the pictures taken both by remote cameras and by astronauts, meteorology and remote sensing of Earth, and planetary studies out in the solar system are described in the first part. The second half consists of a 54-picture color section plus numerous black and white photos showing a fascinating array of subjects.

Dixon, Robert T. *Dynamic Astronomy.* Third edition. Prentice-Hall, 1980. LC# 74-19467. ISBN 0-13-22167-6. 440 pp. Color photos and diagrams. Index. Glossary. Adult.

A paperbound textbook for the nontechnical student presented in traditional fashion. First, the history and methods of astronomy are described, followed by Earth and its Moon. Then the student is taken outward into the solar system, to the stars, and finally to the universe as a whole. Each chapter ends with questions and suggestions for further reading.

Doherty, Paul. *Atlas of the Planets.* McGraw-Hill, 1980. LC# 80-12347. ISBN 0-07-017341-9. 143pp. Color and b/w photos and art. Index. Glossary. Bibliography. Introduction by Patrick Moore. Secondary and adult.

A straightforward introduction to the planets, as they can be observed from Earth, by naked eye or with telescope, and as they have been rediscovered in recent years through the new techniques of astronomy and space exploration. Intended primarily for the amateur astronomer, the volume's captions, for both photos and imaginary views, give date, universal time, type of instrument, and magnification. An amazing amount of detail is included both on observation and history of discoveries.

Dooling, Dave, editor. *Shuttle to the Next Space Age.* Am. Inst. of Aeronautics and Astronautics, 1979. 130pp. B/w photos and art. Adult.

A paperbound summary of the proceedings of the AIAA Southeast Seminar for Reporters and Teachers, held in 1979 in Huntsville, Alabama. It provided the lay public with a cross-section view of the capabilities and potential of the Space Shuttle. Areas discussed concerned the space program and its goals as a whole, space applications, space science, and international involvement.

Doolittle, R. F., Ken Moritz, and R. D. C. Whilden. *Quasars, Pulsars, Black Holes . . . and HEAO's.* NASA EP-120. US GPO, 1974. Stock no. 3300-00542-3. 24pp. Color photos and art. Glossary. Bibliography. Secondary and adult.

Astrophysics, the physics of stars, takes on exciting new dimensions as the result of recent discoveries in the invisible high-energy universe where physical processes are so powerful they cannot be reproduced on Earth. The High-Energy Astronomy Observatories are investigating these mysteries.

Dunne, James A., and Eric Burgess. *The Voyage of Mariner 10: Mission to Venus and Mercury.* NASA SP-424. US GPO, 1978. Stock no. 3300-00710-8. LC# 77-18956. 224pp. Color and b/w photos. Index. Secondary and adult.

The 1973-74 flight of Mariner 10 was a mission of firsts: first American craft to photograph Venus, first to use one planet's gravity to send it on to another, and first to investigate Mercury. The comprehensively illustrated volume records the five hundred days of Mariner 10 and its incredible views of the inner planets.

Durant, Frederick C., III, and George S. James, editors. *First Steps into Space.* Smithsonian Annals of Flight No. 10. Smithsonian, 1974. Stock no. 4705-0011. LC# 73-16298. 307pp. B/w photos and diagrams. Index. Adult.

Proceedings of the First and Second History Symposia of the International Academy of Astronautics, held at Belgrade, Yugoslavia, in 1967 and 1968. The twenty-seven papers were presented by scientists from all over the world on such space pioneers as Esnault-Pelterie, Giulio Costanzi, and Hermann Oberth (presented by himself). The book is divided into two sections: Pre-1939 Memoirs of Astronautics, and New Contributions to the Historical Literature of Rocket Technology and Astronautics.

Dwiggins, Don. *Into the Unknown: The Story of Space Shuttles and Space Stations.* Golden Gate, 1972. LC# 74-157851. ISBN 0-516-08824-6. 80pp. B/w photos and art. Index. Glossary. Foreword by Krafft A. Ehricke. Intermediate and upper.

A farsighted look at the possible uses of space and other planetary surfaces for usefully expanding man's domain. Begins with Space Shuttle (before its major aspects were confirmed), moves to an historic look at how we reached the edge of space, explores Skylab, and then projects life aboard a permanent space station.

________. *Robots in the Sky: Explorers of Our Solar System*. Modern Science series. Golden Gate, 1971. LC# 72-78396. ISBN 0-516-08844-0. 80pp. B/w photos and diagrams. Index. Glossary. Foreword by George A. Harter, Space Vehicles Division, TRW, Inc. Intermediate and upper.

Describes the program of unmanned exploration of space and planets, starting with Explorer I, which discovered the Van Allen radiation belts, moving to planetary observation, and finally proposals for the next century.

Dyson, Freeman. *Disturbing the Universe*. Harper & Row, 1979. LC# 78-20665. ISBN 0-06-011108-9. 284pp. Index. Adult.

Physicist, astronomer, and, primarily, thinker, Freeman Dyson has played a role in major scientific—and consequently, political—decisions of our era. This book is both autobiography and personal commentary on the science, both nuclear and space, of our time.

E

Ebbighausen, E. G. *Astronomy*. Fourth edition. Physical Science series. Merrill, 1980. LC# 79-52884. ISBN 0-675-08184-X. 159pp. B/w photos and drawings. Index. Bibliography. Adult.

A short text for the nonscience major, requiring no mathematics beyond elementary algebra and concentrating on the question: "How does the astronomer know?" The content is organized within chapters by numbered sections and new terms are set in bold type. The seven chapters cover: history, Earth-Moon relationship, methods of astronomy, planets and moons, the Sun, stellar systems, and galaxies. Review questions are given at the end of each chapter.

Eddy, John A. *A New Sun: The Solar Results from Skylab*. NASA SP-402. US GPO, 1979. Stock no. 3300-00742-6. LC# 78-606052. 220pp. Color and b/w photos. Index. Secondary and adult.

The Apollo Telescope Mount, a battery of solar telescopes, was an important integral part of all space station planning from the beginning. The operation of the ATM was an almost daily activity of all three Skylab crews and the building of knowledge about our Sun was comparable. Although there is some technical material in this colorful book, the text and photos revealing the "new Sun" will appeal to everyone.

Edelson, Edward. *Who Goes There? The Search for Intelligent Life in the Universe*. Doubleday, 1979. LC# 77-80882. Hardcover ISBN 0-385-11257-2. Paperbound ISBN 0-07-018986-2 from McGraw-Hill. 196pp. B/w photos. Index. Adult.

Using the Viking landings on Mars and our own background beliefs about that planet as starting points, the author explores the chemistry of life and the universe, then the tools by which scientists are searching for extraterrestrial intelligence. He presents the entire history of the SETI adventure, certain UFO sightings, the "listening" projects, and current strategies now being investigated. This is a thorough and readable coverage of a subject that has had a lot of speculation.

Edmonds, I. G. *Jet and Rocket Engines: How They Work*. Revised edition. How It Works series. Putnam, 1973. LC# 72-95741. Trade ISBN 0-399-20327-3. Library binding ISBN 0-399-60816-8. 96pp. B/w photos and diagrams. Index. Intermediate and upper.

Explains the basic principles of reaction engines, a very old but also very new concept. The various types of aircraft engines are explained and illustrated, as are liquid and solid propellant rocket engines. Final chapters describe rockets of tomorrow—nuclear, electric propulsion, and even photon.

Edmonson, Harold A., editor. *Famous Spaceships of Fact and Fantasy . . . and How to Model Them.* Kalmbach, 1979. LC# 78-78249. ISBN 0-89024-539-8. 88pp. Color and b/w photos. Glossary. Intermediate and up.

An unusual collection of materials fully describing fictional vehicles and such real craft as Saturn V, Apollo, Space Shuttle, and the Boeing 747. The variety of modeling instructions includes plastic kits, as well as where they are available. Full detail on the missions made by the various real craft is included.

Educational Research Council of America. *Explorers and Discoverers: John Glenn.* Allyn & Bacon, 1975. LC# 73-78345. 44pp. Color and b/w photos. Primary.

A volume in the ERC Social Science Program: Concepts and Inquiry. In this brief, pictorial introduction to early manned spaceflight, questions are asked in the midst of the text. An arrow by a question indicates that it is easy; a dot shows a harder question on which more thinking is needed. The reader needs to draw thoughtful conclusions from the straightforward biographical material.

El-Baz, Farouk. *Astronaut Observations from the Apollo-Soyuz Mission.* Smithsonian Studies in Air and Space No. 1. Smithsonian, 1977. Available from US GPO. Stock no. 047-005-00013-2. 400pp. Color and b/w photos and drawings. Adult.

A study of the Earth Observations and Photography Experiment of Apollo-Soyuz mission in July 1975, of which the author was the Principal Investigator. Its purpose was to check the efficiency and validity of trained observers working in space studying and photographing specific Earth features. In numerous places in this fascinating book, the mission transcript of space-ground communications is used to point out different aspects of human observation.

Eldridge, Frank R. *Wind Machines.* US GPO, 1975. Stock no. 038-000-00272-4. 77pp. B/w photos, diagrams. Glossary. Bibliography. Adult.

Prepared for the National Science Foundation, this volume surveys the history, feasibility, and potential of wind energy. The different types of wind machines and how they work are described.

Emme, Eugene M., editor. *Twenty-five Years of the American Astronautical Society: Historical Reflections and Projections, 1954-1979.* Vol. 2 in the AAS History Series. AAS, 1980. Hardcover ISBN 0-87703-117-1. Paperbound ISBN 0-87703-118-5. 235pp. B/w photos. Index. Adult.

Rather than a full-fledged history, this is a collection of informal memoirs by some of the leaders of the AAS—founders, past presidents, editors, and activists—developed as a product of an AAS History Workshop held in conjunction with the Seventeenth Goddard Memorial Symposium in 1979. It is a combination of astronautical history and forecast and the problems of a fledgling association trying to maintain its independence from larger, older organizations. Appendixes list the more straightforward data of the AAS, such as the winners of its annual awards.

________. *Two Hundred Years of Flight in America: A Bicentennial Survey.* Vol. 1 in the AAS History Series. AAS, 1977. ISBN 0-87703-091-X. 320pp. B/w photos. Index. Foreword by Michael Collins, then First Director of the National Air and Space Museum. Adult.

The proceedings of the first history symposium held at the National Air and Space Museum on November 4, 1976, present a continuum of activity starting with balloons in 1784, only a few months after the first flight in France, through to space exploration. Seven papers cover: ballooning; the airship; general, military, and commercial aviation; and instrumented and manned spaceflight. They are preceded by a "perspectives" paper by the editor and followed by a commentary from a technology historian. Appendixes list U.S. space science missions, applications satellites, and manned spaceflights.

Engdahl, Sylvia. *Our World is Earth.* Atheneum, 1979. LC# 79-11788. ISBN 0-689-30678-4. 32pp. Color art by Don Sibley. Primary.

Imagine that you're an astronaut visiting beings far out in space and have to describe your world of Earth. Other planets are quite different from Earth. The author describes simply what Earth is like, with its satellite, the Moon, both moving in orbit around a star.

________. *The Planet-Girded Suns: Man's View of Other Solar Systems.* Atheneum, 1974. LC# 73-84825. ISBN 0-689-30135-9. 200pp. Combined bibliography and name index. Upper and secondary.

The current interest in the idea of other inhabited planetary systems is not new to our time. The sixteenth-century writer Giordano Bruno defied the Church with his ideas on the subject. This author explores the history of the subject—its respectability and times of disrepute—contemporary thinking, and speculation as to what may happen in the future. The author includes poets' views of life in the universe.

Engelbrekston, Sune. *Planets and Galaxies.* #54 in Knowledge Through Color series. Grosset, 1975. LC# 75-516. Hardcover ISBN 0-448-12048-8. Paperbound ISBN 0-553-02192-3 from Bantam. 200pp. Color photos and art. Index. Intermediate and up.

An observational guide to the heavens: the Sun, the stars, their monthly pattern of constellations; the Moon and planets. Separate sections cover the techniques of astronomy, including exploration of the universe through the space program.

Engle, Eloise, and Arnold S. Lott. *Man in Flight: Biomedical Achievements in Aerospace.* Aerospace Medical Association, 1979. LC# 79-63780. ISBN 0-915268-24-8. 400pp. B/w photos. Index. Bibliography. Introduction by Senator Harrison "Jack" Schmitt. Secondary and up.

The Aerospace Medical Association's 50th Anniversary Commemorative Volume presents the history of man in flight as a continuum from travel in the first balloon to exploring the Moon in the most sophisticated spacecraft. At every stage, the human body has had to be properly understood in order to keep it safe. In personal interviews, the doctors who have dealt with biomedical research during the critical last half-century tell their stories. A chronology of selected events ranges from 1783 to 1979.

Estes, John E., and Leslie W. Senger, editors. *Remote Sensing: Techniques for Environmental Analysis.* Hamilton, 1974. LC# 73-8601. ISBN 0-471-24595-X. 340pp. B/w photos. Index. Glossary. Bibliography. Adult.

A typewritten, hardbound book that collects twelve papers by different authors, introducing the basics of remote sensing, especially as it relates to geography rather than to straight science. Agriculture, land use, geological mapping, natural resources, and urban applications are some of the areas introduced. The long bibliography is keyed to various subjects concerning both the sensors and the use of the data derived.

Estes Industries. *The Alpha Book of Model Rocketry.* Revised edition. Estes, 1976. 32pp. B/w photos and art. Upper and secondary.

A guide explaining the things a new rocketeer will want to know before, during, and after the first launch of a model rocket.

Ezell, Edward Clinton, and Linda Newman Ezell. *The Partnership: A History of the Apollo-Soyuz Test Project.* NASA History Series SP-4209. US GPO, 1978. Stock no. 3300-00730-2. LC# 78-2558. 560pp. Color and b/w photos. Index. Secondary and adult.

On July 17, 1975, an American Apollo spacecraft and a Soviet Soyuz docked in space, in the first joint international manned mission, an outgrowth of the 1972 Nixon-Kosygin summit agreement on cooperation in space. This detailed, nontechnical history offers a view of the development of the cooperation, the early competition, and then the creation of the ASTP itself.

F

Feinberg, Gerald, and Robert Schapiro. *Life Beyond Earth: The Intelligent Earthling's Guide to Extraterrestrial Life.* Morrow, 1980. LC# 80-11832. Hardcover ISBN 0-688-03642-2. Paperbound ISBN 0-688-08642-X. 480pp. B/w photos and art. Index. Bibliography. Adult.

Most people are interested in the question of life elsewhere in the universe, but few of us have the scientific background to discuss the possibilities intelligently. In this volume, a theoretical physicist and a biochemist have collaborated on a clear exposition for the nonscientist of the possibilities for life in realms far different from ours. The surfaces of broiling or frigid planets, the interiors of stars, or the clouds of isolated molecules in interstellar space—each may generate life forms. The authors evaluate our current definition of life and suggest novel chemical and physical bases for life.

Feldman, Anthony. *Space.* Facts on File, 1980. LC# 0-87196-416-3. 336pp. Color and b/w photos and art. Index. Secondary and adult.

The title of this beautiful, well-illustrated book could just as easily be "Astronomy." Here are all the subjects of interest to the star-minded public today—the Sun, our solar system, galaxies, the "Big Bang," man in space, mysteries yet to be solved by science, man's future in space, life in the universe, and UFOs. The pictures are apt and well-captioned. The text packs in a lot of up-to-date detail on complex subjects.

Ferdman, Saul, editor. *The Second Fifteen Years in Space.* Vol. 31 of the AAS Science and Technology series. AAS, 1973. ISBN 0-87703-064-2. 201pp. B/w art. Adult.

Proceedings of the Eleventh Goddard Memorial Symposium held in 1973 in Washington, D.C., which looked into the future of the U.S. space program in the light of its first fifteen years. Sections deal with: 1) Impact on Our National Life, 2) Future National Space Efforts, 3) Technology Disciplines, 4) Exploration of the Terrestrial Planets, and 5) The International Outlook.

Ferris, Timothy. *Galaxies.* Sierra Club, 1980. LC# 80-13139. ISBN 0-87156-273-1. 182pp. Color and b/w photos and art. Index. Glossary. Bibliography. Secondary and adult.

A large, expensive, "coffee-table" book of incredible photographs of the fascinating variety of galaxies found in the universe. These clusters of stars, dust and gas assume different shapes depending on their age, rotation, and composition. And some may contain planetary systems with life of their own. The text is informative and nontechnical, describing what is known and thought about galaxies, but the pictures make this book something special.

________. *The Red Limit: The Search for the Edge of the Universe.* Morrow, 1977. LC# 76-54697. Hardcover ISBN 0-688-03176-5. Paperbound ISBN 0-553-11431-X from Bantam. 287pp. B/w photos. Index. Introduction by Carl Sagan. Adult.

A history of the major discoveries of astronomy in the twentieth century, probably chief of which is the discovery that the light waves of a receding galaxy shift toward the red end of the spectrum, thus demonstrating that our universe is indeed expanding. Shapley, Hubble, Hale, Jansky, Penzias, Wilson, Hoyle, and others—each is seen as a person while making vast contributions to our view of the universe.

Field, George B., Gerrit L. Verschuur, and Cyril Ponnamperuma. *Cosmic Evolution: An Introduction to Astronomy.* Houghton Mifflin, 1978. LC# 77-76420. ISBN 0-395-25321-7. 450pp. Color photos, b/w photos and diagrams. Index. Glossary. Adult.

A textbook introduction to "How did I get here?" for the nontechnical college-level student. The coverage starts with Earth and expands outward through the universe as it can be detected from Earth. Then the history of the evolution of our universe is explored, in the opposite direction—from universe to Earth. Finally, the evolution of life on Earth and possibly elsewhere is discussed. Each chapter concludes with summarizing points, thoughtful questions, and a glossary.

Fielder, G., and L. Wilson, editors. *Volcanoes of the Earth, Moon, and Mars.* St. Martin's, 1975. LC# 74-19887. 126pp. B/w photos and art. Index. Glossary. Bibliography. Adult.

A book designed to augment Earth science classes but of general interest to readers of planetary exploration. Volcanoes and lava flow have come to assume fundamental importance in the interpretation of planetary history. Each chapter ends with suggestions for further reading.

Fields, Alice. *The Sun.* An Easy-Read Fact Book. Watts, 1980. LC# 79-27786. ISBN 0-531-03243-4. 48pp. Color and b/w photos, color art by Tony Gibbons and Mike Tregenza. Index. Primary and intermediate.

An illustrated introduction to our Sun as a star. Its structure and actions are explained, while the effects of its variations on our lives are described. The movements of the solar system are included as well as hints for safe solar viewing.

Fimmel, Richard O., William Swindell, and Eric Burgess. *Pioneer Odyssey: Encounter with a Giant.* NASA SP-349. US GPO, 1975. Stock no. 3300-00662-4. 236pp. Color and b/w photos. Index. Bibliography. Secondary and adult.

Pioneer 10 was the first spacecraft to fly beyond the orbit of Mars and through the asteroid belt. It took the first close-up photos of Jupiter, the giant of our solar system, and was the first man-made object to leave the solar system. This is the story of the Pioneer mission, through both semitechnical detail and personal stories of the people involved.

Fimmel, Richard O., James Van Allen, and Eric Burgess. *Pioneer: First to Jupiter, Saturn, and Beyond.* NASA SP-446. US GPO, 1980. Stock no. 3300-00805-8. 300pp. Color and b/w photos and art. Index. Secondary and adult.

The Pioneer spacecraft are the first real explorers of our solar system. They have moved safely through the asteroid belt, explored Jupiter, and encountered Saturn close up. This large, colorful volume updates earlier Pioneer publications and describes the mission, spacecraft, photographic imagery, the thinking that went into the investigations, and the new scientific understandings derived. The Pioneer craft are now on their way to the distant reaches of the solar system, with power to function for many years.

Firsoff, V. A. *The Solar Planets.* Crane, Russak, 1977. LC# 76-5923. ISBN 0-8448-0964-0. 184pp. B/w photos and diagrams. Index. Adult.

The author uses the title "Solar Planets" to underscore the fact that among the things we have learned about planets in recent years is the likelihood that there are many other planetary systems in the universe. However, he concentrates on describing, in nontechnical fashion, our own planets as they are now known after some years of close investigation, made possible by the space program.

Fisher, David E. *The Creation of Atoms and Stars.* Holt, Rinehart, 1979. LC# 79-4469. ISBN 0-03-046511-7. 152pp. Art by John A. Ney. Intermediate and upper.

Atoms and stars—tiny and large—were both produced out of the original matter of the universe. This book explores for young people the evolution of matter and how we learned about it.

________. *The Creation of the Universe.* Bobbs-Merrill, 1977. LC# 77-76887. Hardcover ISBN 0-672-52333-7. Paperbound ISBN 0-672-52366-3. 119pp. B/w photos and drawings. Index. Secondary.

"In the beginning . . ." was when people first started to wonder about the world at large and how it came to be. The giant step in comprehension did not come until Einstein in this century. In informal style, the author explains Einstein's idea of an expanding universe and the growing belief in the "Big Bang" explanation of its origin. He then looks into where we go from here.

Fishlock, D., editor. *A Guide to Earth Satellites.* Elsevier, 1972. LC# 79-167624. ISBN 0-444-19581-5. 159pp. B/w photos and diagrams. Index. Secondary and adult.

Utilizing a team of eight highly qualified writers, this volume presents an accurate portrayal of the present and potential applications of Earth satellites in peace and war. Properly controlled and used, Earth satellites hold the answers to many of the vast problems confronting mankind.

Fodor, R. V. *Meteorites: Stones from the Sky*. Dodd, Mead, 1976. LC# 76-12513. ISBN 0-396-07369-7. 48pp. B/w photos. Index. Intermediate.

A simple, well-illustrated introduction to the rocks that sometimes crash through Earth's atmosphere, rocks very different from those of Earth. The book concludes with how and where to report if you spot a fall of meteorites.

Fowler, John M. *Energy-Environment Source Book*. National Science Teachers Ass'n, 1975. Stock no. 471-14692. 300pp. B/w artwork. Index. Glossary. Adult.

A complete source book dealing with the issues and problems of energy, as well as the basic facts teachers must have. It is divided into three sections: 1) Energy, Society, and the Environment; 2) Energy, Its Extraction, Conversion, and Use; and 3) Technical Appendixes.

Fowles, Jib, editor. *Handbook of Futures Research*. Greenwood Press, 1978. LC# 77-84767. ISBN 0-8371-9885-2. 822pp. Glossary. Adult.

A major collection of forty-one articles by futurists on numerous aspects of human society and their forecasts for twenty-five or more years. Some of the subjects covered include the controversy between technology and environmental protection, the methods of futures research itself, space settlements, communications, biomedical possibilities, and urban change. Each paper concludes with an extensive bibliography.

Fredrick, Laurence, and Robert Baker. *An Introduction to Astronomy*. Ninth edition. Van Nostrand, 1980. LC# 0-442-22422-2. 590pp. Color and b/w photos, diagrams. Index. Glossary. Bibliography. Instructor's Manual available: ISBN 0-442-22421-4. Adult.

Long a standard in astronomy-for-the-nonscience-major circles, this textbook starts where the student is: looking at the sky and wondering. Observational and historical astronomy, from the Earth to the solar system, and out to the galaxies, lead into the fascinating and popular subjects of today, all presented in open, heavily illustrated format. Each chapter ends with review questions and suggestions for further reading.

Freed, Richard E. *Camp Leader's Model Rocketry Manual*. Revised edition, Estes, 1976. 18pp. B/w photos and art. Bibliography. Adult.

A guide for implementing a beginning model rocketry program for children in grades 4 through 6 in a one-week camp situation. Preparations and each day's suggested activities are discussed. Variations on the basic plan are given for junior high-level camps and long-term camps.

Freeman, Mae B. *Space Base*. Watts, 1972. LC# 71-182290. ISBN 0-531-02029-0. 64pp. B/w art by Raul Mina Mora. Primary.

A "You Are There" approach to a visit by Shuttle to a circular space station in orbit around Earth, with simple explanations for the various things observed. Based on use of Saturn V and Apollo for the basic components of the space station.

Freeman, Mae and Ira. *Arrow Book of Space*. Scholastic, 1977. ISBN 0-590-00405-0. 64pp. B/w photos and art. Primary and intermediate.

A paperback introduction for young children to the whole gamut of space science. Earth and its solar system, space activities to study them, the Sun, the stars, the radio universe—a great deal of information is packed into a simple book.

________. *The Sun, the Moon, and the Stars*. Revised edition. Random House, 1979. LC# 78-64604. Trade ISBN 0-394-80110-5. Library binding ISBN 0-394-90110-X. 61pp. Two-color art by René Martin. Index. Intermediate.

An elementary introduction to the universe and our place in it, concluding with new discoveries of "some strange things in space": quasars, pulsars, and black holes. Some reader activities are integrated into the text where their execution will aid comprehension.

Freeman, Michael. *Space Traveller's Handbook: Everyman's Comprehensive Manual to Space Flight*. Sovereign Books, 1979. LC# 79-64277. ISBN 0-671-96147-0. 208pp. Color and b/w photos and art. Index. Glossary. Secondary and adult.

A complete, illustrated guide for the space tourist or the armchair traveller, prepared in the year 2061 on the centennial of mankind's entering the realm of space and beginning to work and play there. In the course of dealing with the future, a great deal of history and current technology is explained under such subjects as mission preparation (biomedical requirements, personal equipment, training, and space hazards); equipment and spacecraft; control, guidance, and orbital mechanics; and space geography. A chronology of events carries the reader to 2061.

French, Bevan M. *Mars: The Viking Discoveries*. NASA EP-146. US GPO, 1977. Stock no. 3300-00703-5. 36pp. Color and b/w photos. Upper and up.

A fascinating collection of photographs taken by Viking landers and orbiters illustrate this booklet, which features the results of the Viking mission to study the atmosphere and geology of Mars and to analyze its soil and search for evidence of life. Experiments and activities to augment the understanding of the text are included as are suggestions for further reading and films.

________. *The Moon Book: Exploring the Mysteries of the Lunar World*. Penguin, 1977. LC# 76-45672. ISBN 0-14-004340-3. 287pp. B/w photos. Index. Secondary and up.

A Moon-rock expert for NASA, the author brings the reader up to date on what happened to those rocks and what scientists have learned about them. This original paperback also includes a review of the entire Apollo program written from the unusual point of view of the rock hunter.

________. *What's New on the Moon?* NASA EP-131. US GPO, 1976. Stock no. 3300-00653-5. 24pp. B/w photos. Upper and up.

A summary of the new knowledge obtained through Apollo manned expeditions to the Moon. The thoroughly illustrated booklet presents not only what is now known about the Moon but also the knowledge about the Earth, Sun, and remainder of the solar system that was gained through this new lunar knowledge. The conclusion details what mysteries remain to be solved.

Friedman, Herbert. *The Amazing Universe.* National Geographic, 1975. LC# 74-28806. ISBN 0-87044-179-5. 200pp. Color photos and art. Index. Glossary. Foreword by Philip Morrison. Secondary and adult.

National Geographic, in its familiar, highly illustrated manner, takes the reader on a journey through the universe, concentrating just as heavily on the process and people of discovery as on the discoveries themselves. The current excitements of quasars and black holes are treated as is the historical development of astronomical thought.

Friskey, Margaret. *The True Book of the Moon-ride Rock Hunt.* Childrens Press, 1972. LC# 72-1457. ISBN 0-516-01144-8. 48pp. Color photos. Intermediate.

An unusual book for young readers about an unusual vehicle, the Rover, first used by astronauts of Apollo 15 to explore the surface of the Moon farther from their craft than previous Apollo astronauts had been able to do.

Froehlich, Walter. *Apollo Soyuz.* NASA EP-109. US GPO, 1977. Stock no. 3300-00652-7. 132pp. Color photos and diagrams. Secondary and adult.

The full story of the historic 1975 Apollo-Soyuz Test Project in which American astronauts and Soviet cosmonauts joined their spacecraft in orbit and conducted joint scientific experiments. ASTP was the first international manned space mission; its implications and impact are discussed.

G

Gadler, Steve J., and Wendy Wriston Adamson. *Sun Power: Facts about Solar Energy.* Lerner, 1978. LC# 77-92290. ISBN 0-8225-0643-2. 104pp. B/w photos. Index. Glossary. Upper.

Introduces the sources of energy we use on Earth and shows how most of them originate from the Sun. The author describes how Sun-worship of old has now become Sun-utilization, which may expand in the future as new techniques of energy conversion are developed. A major chapter asks and answers pro and con questions about the use of solar energy.

Gale, William A., editor. *Life in the Universe: The Ultimate Limits to Growth.* AAAS Selected Symposium 31. Westview, 1979. LC# 79-5132. ISBN 0-89158-378-5. 121pp. B/w photos and diagrams. Index. Adult.

Explores an alternative to the pessimism of the idea of "limits to growth" in the prospects for extraterrestrial colonization. The five subjects are: 1) Humanization beyond Earth: The New Age of Space Industrialization; 2) Limits to Growth Implications of Space Settlements; 3) Space Exploration: Prospects and Problems for Today and the Future; 4) Models of Long Range Growth; and 5) Improving the Prospects for life in the Universe. Each article is abstracted and has its own references.

Gallant, Roy A. *Beyond Earth: The Search for Extraterrestrial Life.* Four Winds Press, 1977. LC# 77-5790. ISBN 0-590-07437-7. 191pp. B/w photos and diagrams. Index. Glossary. Bibliography. Upper and secondary.

An account of exobiology in two parts: "The Search Within" explores the history of our view of the universe from ancient times, in science, and in science fiction. "The Search Beyond" discusses where we might profitably search for other life: planetary requirements, our own technology for searching, and the prospects for discovery.

________. *Fires in the Sky: The Birth and Death of Stars.* Four Winds Press, 1978. LC# 78-4339. ISBN 0-590-07475-X. 162pp. B/w photos and diagrams. Index. Upper and secondary.

Branching out from what the reader knows and observes, the author carries the curious out into the universe where are found the puzzles that scientists are exploring and discussing today, such as black holes and variable stars. Throughout the book, the author refers back to the bedrock of our own Sun . . . as well as the mind-boggling statement, "A small part of you once helped [a supernova] shine for a fraction of a second of its lifetime. You and I are products of stellar evolution."

________. *Man's Reach for the Stars.* Doubleday, 1971. LC# 74-129895. Trade ISBN 0-385-04206-X. Library binding ISBN 0-385-06700-3. 204pp. Color and b/w photos, b/w art. Index. Upper.

A discussion for young adults of the challenge of space travel to the human mind and body. It starts with an historical look at our venturing away from the Earth's surface, higher and higher, then faster and faster, ending the first half with a look at requirements for living in space. The second portion of the book describes our quest for knowledge about the planets and the possibility of journeys to the stars.

Gallob, Edward. *City Rocks, City Blocks and the Moon.* Scribners, 1973. LC# 73-1333. ISBN 0-684-13542-6. 48pp. B/w photos. Index. Intermediate.

"A geologic adventure . . . right at your own doorstep" introduces the young reader to noticing the rocks around him or her. Large, excellent photos by the author show exactly what he is discussing, from brownstone houses to eroding tombstones to parking-lot gravel. It all leads to a brief discussion of rocks found on the Moon and challenges the reader to select Earth rocks for a visitor from outer space.

Galloway, Jonathan F. *The Politics and Technology of Satellite Communications.* Lexington Books, 1972. LC# 72-5238. ISBN 0-669-84467-5. 247pp. Index. Acronym glossary. Bibliography. Adult.

An historical study of the American governmental process of developing a communications satellite program and the international process of creating the International Telecommunications Consortium, which launches INTELSAT satellites.

Gammon, Richard H. *Chemistry between the Stars.* NASA EP-127. US GPO, 1977. Stock no. 3300-00655-1. 72pp. B/w photos and diagrams. Glossary. Bibliography. Secondary and adult.

A booklet prepared in cooperation with the American Astronomical Society. Designed for use and interpretation by secondary school science teachers, it describes the nature of interstellar space, the physical conditions, kinds of molecules found, methods of identifying molecules, energy radiation, dust and gas clouds, "star factories," and the like. The other three booklets in the group are: Blanchard, *Atoms in Astronomy;* Jacobs, *Extragalactic Astronomy;* and Straka, *The Supernova.*

Gardner, Martin. *The Relativity Explosion.* Vintage Books, 1976. LC# 76-10588. ISBN 0-394-72104-7. 198pp. B/w art by Anthony Ravielli. Index. Secondary and adult.

A completely revised version of the author's *Relativity for the Millions.* This book clarifies and updates for laypersons the recent advances in actually testing Einstein's theories of relativity. It explains the discoveries of quasars, pulsars, and black holes, which are objects of relativistic interest. The author also lays to rest the steady-state theory of cosmology.

Gardner, Robert. *Space: Frontier of the Future.* Doubleday, 1980. LC# 78-22319. Trade ISBN 0-385-14500-4. Library binding ISBN 0-385-14501-2. 162pp. B/w photos and art. Index. Upper.

An imaginative look at what is to come in space—shuttles, exploration of Mars, permanent space stations, settlements. In each case, the author carefully describes the past as prelude to what will come. At the end the reader is asked thoughtful "Questions for Space Experts."

Gatland, Kenneth. *Manned Spacecraft.* Revised edition. Macmillan Color series. Macmillan, 1976. LC# 76-1994. ISBN 0-02-542820-9. 304pp. Color and b/w photos and diagrams. Index. Glossary. Secondary and adult.

A detailed and fully illustrated history of man in space, technically, politically, and sociologically, with clear explanations of all major and many minor events.

________. *Missiles and Rockets.* A Pocket Encyclopedia of Spaceflight in Color. Macmillan, 1975. LC# 75-15641. ISBN 0-02-542860-8. 256pp. Color and b/w photos and art. Index. Upper and secondary.

A compact history of missiles from Pennemunde through the Space Shuttle launcher, including the technology and political scene involved in each stage of the development.

________. *Robot Explorers.* A Pocket Encyclopedia of Spaceflight in Color. Macmillan, 1972. LC# 72-78611. ISBN 0-7137-0573-6. 251pp. Color photos and art. Index. Upper and up.

A pocket-sized directory of unmanned exploration of space by all nations with programs. Details in both art and text are included in four sections: Prelude to Apollo, USSR on the Moon, Planetary Probes, and Mars and Beyond.

________. *Rockets and Space Travel.* Fact Finders series. Silver Burdett, 1976. LC# 78-64661. ISBN 0-382-06243-4. 23pp. Color art. Index. Primary and intermediate.

A picture book of space with numerous concepts quickly introduced—principles of rocketry, Moon probes, men in space, space stations, exploring the planets, and ending with the Space Shuttle.

________. *The Young Scientist Book of Spaceflight.* EMC Corp., 1978. LC# 78-17504. ISBN 0-88436-526-3. 32pp. Color photos and art. Glossary. Intermediate.

With more illustration than text, this book introduces to young hobbyists the story of the Space Age from the V-2 rocket to the Space Shuttle and beyond. Numerous activities are incorporated to illustrate such principles as rocketry, forces, temperature control, artificial gravitation. The book concludes with space "firsts" and "facts," a glossary, and a rocket comparison chart.

Gatland, Kenneth W., and Derek Dempster. *Worlds in Creation.* Regnery, 1974. LC# 74-6891. ISBN 0-8092-8347-6. 232pp. B/w photos and diagrams. Index. Bibliography. Foreword by Patrick Moore. Adult.

Relates the evolution of the universe to mankind, as it traces the development of elements in the galaxy down to living things. Ultimately, the author reaches the question of other life in the universe and even the possibility of other universes.

Geis, Larry, and Fabrice Florin, editors, with Peter Beren and Aidan Kelly. *Worlds Beyond: The Everlasting Frontier.* And/Or Press, 1978. LC# 78-54345. Hardcover ISBN 0-915904-36-5. Paperbound ISBN 0-06-080499-8 from Harper & Row, published as *Moving into Space: The Myths and Realities of Extraterrestrial Space.* 302pp. Foreword by Jacques Vallée. Adult.

A product of the New Dimensions Foundations, this collection of essays is a guide to "the greatest adventure of all time"—man's movement out into space. Starting with Buckminster Fuller, who coined the term "spaceship Earth," it offers such views as those of astronauts, a governor, and Gerard K. O'Neill on space colonies. The major sections are: Reaching Outward: The Adventure of Space; Space Industries: A Design for the Future; Extraterrestrial Life: The Scientific Search; The UFO Phenomenon: The Enigma of Our Time; and Space Age Myths: The Future is Now.

Gemme, Leila Boyle. *The True Book of Spinoffs from Space.* Childrens Press, 1977. LC# 76-49936. ISBN 0-516-01209-6. 46pp. Color photos. Primary and intermediate.

Explains for the young the inventions developed by the space program that have proved useful on Earth, including spinoffs that improve our safety, the environment, health, and even daily use.

_______. *The True Book of the Mars Landing.* Childrens Press, 1977. LC# 77-22106. ISBN 0-516-01145-6. 48pp. Color and b/w photos. Primary and intermediate.

Describes for young readers the Mars landings of Viking I and II and their search for signs of life. The book covers the things discovered through photography and scientific sensors, as well as the details of the search for life.

George, Frank, editor. *Science Fact.* Sterling, 1978. LC# 78-51061. Trade ISBN 0-8069-3094-2. Library binding ISBN 0-8069-3095-0. 551pp. B/w photos and drawings. Index. Foreword by Desmond Morris. Secondary and adult.

Examines the search for the most dramatic and significant developments at the frontier of each major field of science. Of particular interest are chapters on astronomy, space science, transportation, and communication. Extensive references are given at the close of each chapter.

Gilfillan, Edward S., Jr. *Migration to the Stars: Never Again Enough People.* Luce, 1975. LC# 74-28616. ISBN 0-88331-072-4. 226pp. Secondary and adult.

An imaginative engineer examines the probabilities that Earth may become uninhabitable in the next century or so. He reviews each of the possible barriers to man's moving outward into space and finds nothing to prevent the human race from continuing its evolution elsewhere. Each chapter concludes with notes that augment the discussion.

Gilleo, Alma. *Communications from the Beginning.* Child's World, 1977. LC# 77-24211. ISBN 0-89565-003-7. 32pp. Color art by John Nelson. Primary.

Satellites are shown to be an extension of our communications history since early man began to draw pictures on cave walls.

Gingerich, Owen, editor. *Cosmology Plus One: Readings from Scientific American.* Freeman, 1977. LC# 77-1448. Hardcover ISBN 0-7167-0012-3. Paperbound ISBN 0-7167-0011-5. 113pp. B/w photos, two-color diagrams. Index. Bibliography. Adult.

A collection of articles from *Scientific American* on our search for understanding of the universe as a whole—galaxies, background radiation, black holes, quasars, expansion of the universe. The "Plus One" is an extra article at the end that discusses the search for life elsewhere in the universe.

_______. *New Frontiers in Astronomy: Readings from Scientific American.* Freeman, 1975. LC# 75-8902. Hardcover ISBN 0-7167-0520-6. Paperbound ISBN 0-7167-0519-2. B/w photos, two-color diagrams. Index. Adult.

A selection of thirty-one semitechnical articles on astronomy that have appeared in *Scientific American,* primarily in the 1970s. Each section is introduced by astrophysicist Gingerich to relate it to new observations and to other articles. The sections are: 1) The Planetary Systems, 2) The Sun, 3) Stellar Evolution, 4) The Milky Way, 5) Galaxies, 6) High-energy Astrophysics, and 7) Cosmology.

Ginzberg, Eli, et al. *Economic Impact of Large Public Programs: The NASA Experience.* Olympus, 1976. LC# 76-5467. ISBN 0-913420-68-9. 176pp. Index. Adult.

The report of a three-year study by the Conservation of Human Resources into one example of large public expenditure and its effect on the general economy. The method used called for major case studies of areas in which NASA had clearly left its mark: the computer industry, astronomy, and weather forecasting. Then generalizations are drawn from the case studies.

Glasby, John S. *Boundaries of the Universe.* Harvard, 1977. LC# 76-162638. ISBN 0-674-08015-7. 296pp. B/w photos. Index. Adult.

History and projection of how the observable boundaries of the universe have been and are still being steadily pushed back—by telescope, spectroscope, rocketry, now invisible portions of the electromagnetic spectrum. Each problem solved has opened a host of new questions to be answered.

Glenn, Jerome Clayton, and George S. Robinson. *Space Trek: The Endless Migration.* Stackpole, 1978. LC# 78-15969. Hardcover ISBN 0-8117-1581-7. Paperbound ISBN 0-446-91122-4 from Warner. 224pp. B/w photos. Index. Bibliography. Secondary and adult.

Starting with the Space Shuttle, the age-old dream of travel among the stars is beginning to take on reality, and the next migrations may be out into the universe. This book discusses some of the practical politics, cultural decisions, and even salesmanship that will have to go on to turn Earth's mankind into "Spacekind." Illustrated with a large collection of unusual pictures drawn from far-reaching sources.

Golden, Frederic. *Colonies in Space: The Next Giant Step.* Harcourt Brace, 1977. LC# 76-46784. ISBN 0-15-219400-2. 145pp. B/w photos and drawings by Kiyo Komoda. Index. Glossary. Bibliography. Upper and up.

Is space colonization just a far-flung dream or a projection of current reality? The author explores the concept popularized by Gerard K. O'Neill (see O'Neill: *The High Frontier*) of habitats in space, how previous writers got us to this possible point, how it can be done, the meaning of L-5 as a possible location in space, and what work and fun might be like in such a colony.

________. *Quasars, Pulsars, and Black Holes: A Scientific Detective Story.* Scribners, 1976. LC# 75-37646. Hardcover ISBN 0-684-14501-4. Paperbound ISBN 0-671-80947-4 from Pocket Books. 205pp. B/w photos. Index. Glossary. Bibliography. Secondary and adult.

Starting with a brief history of astronomy and discussing the nature of light, this interesting volume describes the current revolution in astronomy caused by the discovery of celestial objects that don't fit the classical categories. A knowledge of the technicalities is not needed.

Goldsmith, Donald. *The Evolving Universe: An Introduction to Astronomy.* Benjamin/Cummings, 1981. LC# 80-24277. ISBN 0-8053-3327-4. 539pp. Color and b/w photos, two-color diagrams. Index. Glossary. Student Study Guide and Instructor's Resource Manual available. Adult.

A basic, introductory textbook, essentially a totally new edition of the author's 1976 text, *The Universe.* The change in the title reflects the increased content on the recent discoveries, considerable material on radio and X-ray astronomy, astrophysics, and planetary astronomy developing from the space program. It moves from the universe, to stars, to solar system, to the quest for life. Each chapter ends with a summary, Key Terms, questions, and suggestions for further reading.

________. *The Quest for Extraterrestrial Life: A Book of Readings.* University Science Books, 1980. LC# 79-57423. Hardcover ISBN 0-935702-08-3. Paperbound ISBN 0-935702-02-4. 308pp. Index. Bibliography. Foreword by Sir Fred Hoyle. Adult.

Starting with the writing of Lucretius in 70 B.C., this collection of materials on the possibility of extraterrestrial life contains a great diversity of opinion. The fifty-eight items range from newspaper clippings to Atomic Energy Commission reports to articles from the *Quarterly Journal of the Royal Astronomical Society.* They are divided into six areas: 1) Historical Perspective, 2) Origins of Life, 3) Search for Life in the Solar System, 4) Intelligent Life Outside the Solar System?, 5) Optimists and Pessimists, and 6) Bread on the Waters.

Goldsmith, Donald, editor. *Scientists Confront Velikovsky.* Cornell, 1977. LC# 77-2457. Hardcover ISBN 0-8014-0961-6. Paperback ISBN 0-393-00928-9 from Norton. 183pp. Index. Foreword by Isaac Asimov. Adult.

In 1950, Immanual Velikovsky, a Russian-born doctor of medicine, published *Worlds in Collision,* first in a series of books that challenged the established scientific views of our solar system and purported to confirm Biblical catastrophes. These primarily involved Venus as a body ejected from Jupiter and almost colliding with Earth in the process. Since that time some of his "heretical" predictions of what would be found if we could go to the planets have seemingly been vindicated, and public interest in the writer has increased. This volume derives from a 1974 meeting of the American Association for the Advancement of Science, instigated by astronomer Carl Sagan, at which several scientists for the first time publicly challenged Velikovsky's ideas. In fact, the AAAS forum also presented scientists in support of Velikovsky, but they refused to have their comments reproduced in this volume. Instead, they made their own in Greenberg: *Velikovsky and Establishment Science* (see below).

Goldsmith, Donald, and Donald Levy. *From the Black Hole to the Infinite Universe.* Holden-Day, 1974. 73-86412. LC# 0-8162-3323-3. 330pp. B/w diagrams. Index. Secondary and adult.

A "semitextbook" for the nontechnically minded that introduces contemporary astronomy and physics to the general reader or student. Each chapter begins with a science fiction story that serves as a jumping-off point for the explanation of such subjects as black holes, antimatter, the expanding universe, curvature of space, and supernovas. Each chapter concludes with a summary and questions.

Goldsmith, Donald, and Tobias Owen. *The Search for Life in the Universe.* Benjamin/Cummings, 1980. LC# 79-18653. ISBN 0-8053-3325-8. 436pp. B/w photos and diagrams. Index. Foreword by Carl Sagan. Adult.

A survey textbook for the nonscience major, combining biology and cosmology. The authors think that "The tension between rigorous proof and free-ranging speculation provides one of the most enjoyable aspects of scientific research." They discuss why we search, the universe at large, what life is, the search in our solar system, and the search for extraterrestrial intelligence. Each chapter ends with a summary, questions, and suggestions for further reading.

Goldstein, Laurence, editor. *The Moon Landing and Its Aftermath.* Spring 1979 issue of *Michigan Quarterly Review,* Vol. 18, No. 2. 363pp. B/w photos of artwork. Secondary and adult.

A fascinating collection of essays on the cultural impacts of the landings on the Moon, describing the impacts on art, film, poetry, symbolism, and human consciousness.

Goody, Richard M., and James C. G. Walker. *Atmospheres.* Foundations of Earth Science series. Prentice-Hall, 1972. LC# 78-172279. Hardcover ISBN 0-13-050096-8. Paperbound ISBN 0-13-050088-7. 150pp. B/w photos and diagrams. Adult.

The series of books of which this is a part was develped on the conviction that even beginning students deserve to share in the excitement of current research instead of being bound to a traditional textbook. Drawing on discoveries about other planets through the space program, the authors relate physical and chemical processes to atmospheric processes on Earth.

Graphic House. *Color Your Way Through Space at Kennedy Space Center.* Graphic House. 24pp. Color and b/w art. Primary and up.

The entire history of space exploration is reviewed through coloring book pages based on Kennedy Space Center exhibits. The last seven pages are games and quizzes, and the back cover becomes the board and playing pieces of a game called "Jump to the Moon."

Grayson, L. P., F. W. Norwood, and H. E. Wigren. *Man-Made Moons: Satellite Communications for Schools.* National Education Ass'n, 1972. NEA Stock no. 381-11994. 48pp. B/w photos. Glossary. Foreword by Sidney P. Marland, Jr., then U.S. Commissioner of Education. Adult.

A booklet on the potential for educational applications of communications satellites, written to encourage educators to take a leadership role in determining satellite use and to make them aware of satellites' impact on the classroom. An important chapter raises policy questions for the professional educator.

Greeley, Ronald, and Michael H. Carr, editors. *A Geological Basis for the Exploration of the Planets.* NASA SP-417. 1976. Available from NTIS. N77-15961. 109pp. B/w photos and diagrams. Adult.

A study of the implications of the exploration of the planets for geophysics, geochemistry, geodesy, cartography. Many of the questions to be researched through planned planetary exploration programs are discussed. A full bibliography is given at the end of each chapter.

Green, Constance McLaughlin, and Milton Lomask. *Vanguard: A History.* Smithsonian, 1971. LC# 70-606624. ISBN 0-87474-112-2. 309pp. B/w photos. Index. Adult.

The first major steps toward transforming the dreams of such men as Robert Goddard into reality took place with the Vanguard rocket program. This history portrays all the achievements and foibles of the men and politics involved in a period of Cold War.

Greenberg, Lewis M., editor. *Velikovsky and Establishment Science.* Kronos Press, 1977. Hardcover ISBN 0-917994-03-5. Paperbound ISBN 0-917994-04-3. 144pp. Adult.

In 1974, an AAAS Symposium on Velikovsky's 1950 book, *Worlds in Collision,* was held in San Francisco (see Goldsmith: *Scientists Confront Velikovsky*). This volume contains Velikovsky's own address to the audience and a full-scale rejoinder to the arguments made.

Greenleaf, Peter. *Experiments in Space Science.* Revised edition. Arco, 1980. LC# 79-13299. Library binding ISBN 0-688-05104-3. Paperbound ISBN 0-668-04812-3. 166pp. B/w photos and diagrams. Index. Glossary. Upper and secondary.

Much of interest in astronomy and space science can still be carried out with the naked eye and simple equipment. Easy instructions are given for building basic astronomical instruments to observe and measure the movements of the Moon, Sun, stars, planets, meteors, and rockets. The reader can even make "space bread" from algae. Review questions and answers are given at the end of the book.

Greve, Tim, Finn Lied, and Erik Tandberg, editors. *The Impact of Space Science on Mankind.* Plenum, 1976. LC# 76-26652. ISBN 0-306-33701-0. 125pp. B/w photos. Secondary and adult.

Edited summaries of eight papers and discussions presented at the 1975 Nobel Symposium # 31, covering the impact of space sicence, space communications, Earth resources exploration from space, and space-assisted meteorology. These subjects are discussed both in practical terms and philosophically.

Grey, Jerry. *Enterprise.* Morrow, 1979. LC# 79-10544. Hardcover ISBN 0-688-03462-4. Paperbound ISBN 0-671-83379-0 from Pocket Books. 288pp. B/w photos and drawings. Index. Foreword by Issac Asimov. Secondary.

The first orbital flight of the Space Shuttle has launched the world into the true Space Age. Starting from the first Orbiter off the production line, named *Enterprise*, the author presents a full portrayal of what the Shuttle is, how and why it came into being, how it works, and what it will do. A chronology of related events, past and proposed, is included.

Grey, Jerry, Peter Downey, and Bruce Davis, editors. *Space: A Resource for Earth.* An AIAA Review. Am. Inst. of Aeronautics & Astronautics, 1977. 76pp. B/w photos and diagrams. Secondary and adult.

Sponsored by AIAA's Technical Committee on Space Systems, this review documents the many applications of space systems to improving the quality of human life on Earth. Highlighted in nontechnical fashion are communications satellites, navigation satellites, land and sea observations, atmospheric sensing, and such potential capabilities as space processing and space-based solar power.

Gribbin, John. *Astronomy for the Amateur.* McKay, 1977. LC# 76-27607. ISBN 0-679-20384-2. 94pp. Color and b/w photos, diagrams. Index. Upper and secondary.

Building on the sense of wonder that most people feel when they look at the night sky, the author and his well-chosen photographs develop a basic understanding of astronomy as an interesting observational activity. Final chapters introduce astronomical photography and radio astronomy for the amateur.

________. *The Death of the Sun.* Delacorte, 1980. LC# 79-22191. Hardcover ISBN 0-440-01924-9. Paperbound ISBN 0-440-51854-7 from Delta. 195pp. B/w drawings. Index. Bibliography. Secondary and adult.

For most of us, even most scientists, our Sun is a constant that may, in the far, far distant future, begin to change. The author, an astrophysicist, explores the startling idea that the Sun may be an inconstant friend, subject to flickering spasms that could spell total catastrophe at any time.

________. *Our Changing Universe: The New Astronomy.* Dutton, 1976. LC# 76-4129. ISBN 0-87680-216-6. 160pp. Color and b/w photos. Index. Secondary.

The story and explanations of the dramatic changes that have occurred in astronomy since the discovery of the first quasar in the early 1960s, followed by pulsars and X-ray stars discovered by X-ray astronomy satellites. Sufficient background technology is given for the reader to comprehend how our view of the universe is changing.

________. *White Holes: Cosmic Gushers in the Universe.* Delacorte, 1977. LC# 77-8508. ISBN 0-440-09529-8. 296pp. B/w photos. Index. Glossary. Bibliography. Secondary and adult.

Black holes have caught the public fancy, but this astrophyscist turns the black hole "appetite" around and explores the idea that if things go into black holes, they might come out white holes. The book incorporates a great deal of current knowledge with speculation. It concludes with an appendix dealing with a puzzle closer to hand: Is our Sun a normal star?

Grissom, Betty, and Henry S. Still. *Starfall.* Crowell, 1974. LC# 74-7285. ISBN 0-690-00473-7. 276pp. Index. Secondary and adult.

The widow of astronaut Virgil "Gus" Grissom tells the story of how her husband and family were caught up in the American program to reach the Moon. One of the original seven astronauts, Grissom flew a Mercury flight and a Gemini flight and was scheduled to go to the Moon when he and two other astronauts were killed in a spacecraft fire during a ground test. That fire caused a complete re-evaluation and redesign of the Apollo spacecraft.

Guest, John, editor. *The Earth and Its Satellite.* McKay, 1971. LC# 71-160333. 164pp. Color and b/w photos. Index. Glossary. Secondary and adult.

A comprehensively illustrated, large-sized book of astronomy and geology that treats the Earth and its processes as part of a larger system incorporating our satellite and our place in the solar system. Many NASA photos of Earth are included.

Guest, John, and R. Greeley. *Geology on the Moon.* Wykeham Science series. Crane, Russak, 1977. LC# 77-15306. ISBN 0-8448-1170-X. 235pp. B/w photos. Index. Adult.

Fifteen years of research into the Moon have comprehensively changed science's view of Earth's companion. Unmanned and manned research have shown meteoric impact and volcanism to be the principal processes that produced the Moon as we see it. Numerous photos are used to illustrate details discussed in a semitechnical fashion.

Gurney, Gene. *Space Technology Spinoffs.* Impact series. Watts, 1979. LC# 78-21617. ISBN 0-531-02290-0. 88pp. B/w photos. Index. Bibliography. Upper and secondary.

A description of NASA as the origin of space spinoffs through that government agency's concept of technology transfer to the community. Some areas in which spinoffs have occurred are shown: medicine, environment, energy, safety, food, industry and transportation, and even sports and recreation.

Gurney, Gene and Clare. *Cosmonauts in Orbit: The Story of the Soviet Manned Space Program.* Revised edition. Watts, 1974. LC# 76-189516. ISBN 0-531-02572-1. 192pp. B/w photos. Index. Upper and secondary.

An over-sized, well-illustrated book that begins with Yuri Gagarin's journey into space in Vostok I and then looks back to the history of the Soviet space program. Soviet manned flight through the various Soyuz missions is detailed and illustrated. The book ends in anticipation of the cooperative US-USSR Apollo-Soyuz flight in 1975.

_______. *The Launching of Sputnik, October 4, 1957: The Space Age Begins.* A World Focus Book. Watts, 1975. LC# 75-5545. ISBN 0-531-02175-0. 86pp. B/w photos. Index. Bibliography. Upper and secondary.

October 4, 1957, was a day which, as one reporter put it, "forever separates the old from the new." The authors clearly present the trail of discovery and experiment that led up to that day, a day of success for Soviet scientists, and of abrupt policy changes for the United States. Liberal use of unusual photos enhance the text.

H

Hacker, Barton C., and James M. Grimwood. *On the Shoulders of Titans: A History of Project Gemini.* NASA SP-4203. US GPO, 1977. Stock no. 3300-00643-8. 645pp. Color and b/w photos. Index. Secondary and adult.

It was the two-man Gemini flights that capitalized on the tentative beginnings of the Mercury program and paved the way to the Moon for Apollo. In ten manned flights made in less than twenty months, the techniques of space travel were tried and perfected. This book is the complete, detailed account of the program as well as of the building of the huge NASA Manned Space Flight Center (later Lyndon B. Johnson Space Center) at Houston, Texas.

Halacy, D. S., Jr. *The Coming Age of Solar Energy.* Revised edition. Harper & Row, 1973. LC# 72-79670. Hardcover ISBN 0-06-011714-1. Paperback ISBN 0-380-00233-7 from Avon. 231pp. B/w photos and diagrams. Index. Upper and secondary.

A comprehensive look at the energy crisis of our times, the possible solutions, rediscovery of the Sun as a fantastic power source, photochemistry, orbiting solar power stations, and thermal sea power.

_______. *Experiments with Solar Energy.* Grosset & Dunlap, 1975. LC# 69-18892. ISBN 0-448-26119-7. 131pp. B/w photos and diagrams. Index. Bibliography. Upper.

Introducing our Sun and activities to do with its energy: solar furnaces, cooker, oven, water heater, even a solar-powered radio. The equipment needed is straightforward.

Hall, Al, editor. *Petersen's Book of Man in Space.* Petersen, 1974. Five paperbound volumes, 144pp. each. Color and b/w photos. Secondary and adult.

This five-volume paperbound set is a thoroughly illustrated chronological history of the space program from the pioneers of rocketry and Peenemunde in Germany through the mission of Apollo 17, last flight to the Moon. Each page consists primarily of photographs with brief text explaining the pictures and expanding on them. There is no index, glossary, or bibliography.

Vol. 1: *The First Small Step.* LC# 74-81627. ISBN 0-8227-0072-7. Folowing an introduction by astronaut Alfred Worden, the beginnings of rocketry are introduced. The Soviet and American programs are detailed from their beginnings through the end of the Mercury program. A concluding section describes the benefits of satellites on Earth.

Vol. 2: *A New Environment.* LC# 74-82253. ISBN 0-8227-0073-5. Describes in detail the missions of the Gemini program in which "a new environment" was explored and the techniques of travel through it investigated. Special sections provide a tour of the NASA Manned Spacecraft Center in Houston and show the first close-up look at the Moon provided by Ranger, Surveyor, and Orbiter.

Vol. 3: *The Power and the Glory.* LC# 73-82254. ISBN 0-8227-0074-3. The "glory" was to come through Project Apollo, America's program to send men to the Moon and bring them safely home again. The Saturn rockets were developed. Astronauts died perfecting the Apollo craft. Flights through Apollo 6 are described.

Vol. 4: *A Giant Leap for Mankind.* LC# 73-81004. ISBN 0-8227-0075-1. The Apollo craft was tested both in Earth orbit and near the Moon by Apollo flights 7, 8, 9, and 10. The tracking network, space food, launch windows, space suits, and space photography are discussed. Finally, Apollo 11 made a dream of centuries become reality when Armstrong and Aldrin walked on the Moon.

Vol. 5: *Beyond the Threshold.* LC# 73-82003. ISBN 0-8227-0077-8. The major research flights of the Apollo program, flights 12 through 17, are shown in detail. Special sections describe the Apollo communications link, Lunar Rover, and the Lunar Receiving Laboratory.

Hall, R. Cargill, editor. *Essays on the History of Rocketry and Astronautics.* NASA Conference Publication CP-2014, Volumes 1 and 2. US GPO, 1977. Stock no. 3300-00687-0. 728pp. in 2 volumes. B/w photos and diagrams. Adult.

This two-volume, paper-covered book combines the proceedings of the Third through the Sixth History Symposia of the International Academy of Astronautics 1969 through 1972. A total of thirty-nine papers have been organized under four topics: 1) Early Solid-Propellant Rocketry; 2) Rocketry and Astronautics: Concepts, Theories, and Analyses after 1880; 3) The Development of Liquid- and Solid-Propellant Rockets, 1880-1945; and 4) Rocketry and Astronautics after 1945.

Hallion, Richard P. *Legacy of Flight: The Guggenheim Contribution to American Aviation.* U. of Washington, 1977. LC# 77-49161. ISBN 0-295-95542-2. 292pp. B/w photos. Index. Bibliography. Adult.

The history of The Daniel Guggenheim Fund for the Promotion of Aeronautics, created in 1926, is really the history of American aviation. Grants to eight major universities set the tone for aeronautical engineering education. Guggenheim funds played a major role in the promotion of commercial aviation, competitions leading to safety developments, and even revolutionary experiments of rocketeer Robert Goddard. Much of the Guggenheim history intertwines with the history of the National Advisory Committee for Aeronautics, predecessor of NASA.

________. *Supersonic Flight: Breaking the Sound Barrier and Beyond.* Macmillan, 1972. LC# 72-88809. 248pp. B/w photos and diagrams. Index. Introduction by Michael Collins and Melvin B. Zisfein. Secondary and adult.

This is a history of the Bell X-1, first aircraft to break the sound barrier, and the Douglas D-558. Much of the research of that era was done under NACA, predecessor of NASA, and the aircraft were used for numerous flights, testing aspects of supersonic flight that were incorporated into later aircraft. Technical specifications and flight chronologies are included at the end of the volume.

Hallion, Richard P. and Tom D. Crouch, editors. *Ten Years since Tranquillity: Reflections upon Apollo 11.* Smithsonian, 1979. LC# 79-10271. Hardcover ISBN 0-87474-506-3. Paperback ISBN 0-87474-505-5. 174pp. B/w photos. Bibliography. Secondary and adult.

The editors, both curators at the National Air and Space Museum, have collected essays reviewing the social and political factors that led to the first Moon landing. The technological developments, spinoffs, rocketry accomplishments, an artist's view, and scientific results are among the subjects covered, usually by those intimately involved at the time. A chronology of the program, details of each mission, and a research guide are included. A photo essay on Apollo is a highlight of the book.

Hankins, Donna B. *A Practical Guide to Use of Space and Aerial Photography in the Elementary and Secondary School Classroom.* Pilot Rock, 1976. 21pp. B/w diagrams. Adult.

A simple introduction to classroom applications of remote sensing imagery. Describes the space and aircraft used in remote sensing, sources of imagery, and then activities related to pattern association, the meaning of infrared, perspective, scale concept, as well as some specifically remote sensing applications.

Hanson, George, and John Horstman. *Global Games Resource Manual.* Global Games, 1977. 60pp. B/w diagrams. Secondary and adult.

Developed by physical education instructors, this is a guide to playing Global Ball and other games with a Space Net and Ball (the volleyball-type net has "Crater Holes" in it), with applications at different grade levels. Class drills have such names as Skylab Docking, Space Station Passing, Laser Beam, and Hot Moon Rocks. Other space-named games for fun beyond the basic Global Ball are included.

Hapgood, Fred. *Space Shots: An Album of the Universe.* Times Books, 1979. LC# 78-68713. ISBN 0-8129-0823-6. 80pp. Color and b/w photos. Introduction by Michael Collins. Secondary and adult.

One of the prizes of recent space and astronomy events has been the multiplicity of wonderful photographs. This collection of the best of color and black and white photos from the space program and from observatories is captioned in interesting, nontechnical fashion and covers the Earth, the solar system, and the galaxies.

Harris, Gordon L. *Selling Uncle Sam.* Exposition Press, 1976. LC# 76-1102. ISBN 0-682-48481-4. 222pp. Index. Adult.

An insider's story of space-related public affairs activities and problems at Huntsville, Washington, and Cape Canaveral. Harris' account should be of interest to anyone interested in America's space program as well as to those concerned with the community/public relations of tax-supported institutions.

Harris, Richard L. *I Can Read about the Sun and Other Stars.* Troll Associates, 1977. LC# 76-54577. ISBN 0-89375-044-1. 48pp. Art by William Krasncborski. Primary and Intermediate.

The Sun is our special star. It gives us important things we need to live, but it is typical of many stars we can see in the night sky. Even the big constellations make up only a tiny part of the vast universe. Someday we'll find out if there's anyone out there listening to us. Big concepts in a tiny book.

Harris, Susan. *Space.* An Easy-Read Fact Book. Watts, 1979. LC# 78-11288. ISBN 0-531-02852-6. 48pp. Color photos and art by Tony Gibbons. Primary.

Young readers are taken beyond Earth's atmosphere, where life must be supported. This book shows where Earth is in space and how it moves, rocket requirements, and the needs of manned flight. It ends with a brief discussion of the possibilities of life elsewhere in the universe.

Harrison, Harry, and Malcolm Edwards. *Spacecraft in Fact and Fiction.* Exeter Books, 1979. LC# 79-52188. ISBN 0-89673-019-0. 128pp. Color and b/w photos and art. Index. Bibliography. Secondary and adult.

An illustrated history of spacecraft, both real and the products of fertile imaginations, from earliest fantasies to Space Shuttle, and beyond to the far-reaching dreams of future interstellar travel. Illustrations include engravings of Cyrano de Bergerac, art from science fiction publications, scenes from *Star Wars, 2001, Close Encounters,* and *Star Trek,* as well as photos of the space pioneers and NASA spacecraft design.

Hartmann, William K. *Astronomy: The Cosmic Journey.* Wadsworth, 1978. LC# 77-21807. ISBN 0-534-00546-2. 536pp. Color and b/w photos and diagrams. Index. Glossary. Bibliography. Instructor's Manual, with annual supplements, available. Adult.

An introductory astronomy text that conveys the excitement of the cosmos—both visually and conceptually. It follows a traditional order of study from Earth observation of the planets outward to galaxies and cosmology. The material is divided into eight modules: 1) Earth Discoveries, 2) Exploring the Earth-Moon System, 3) The Solar System, 4) Stars and Their Evolution, 5) Environment and Groupings of Stars, 6) Galaxies, 7) Frontiers, and 8) A Selection of Enrichment Essays, covering telescopes, pseudo-sciences, and astronomical coordinates.

_______. *Moons and Planets: An Introduction to Planetary Science.* Wadsworth, 1972. LC# 70-170777. ISBN 0-534-00321-4. 404pp. B/w photos and diagrams. Index. Adult.

An interdisciplinary textbook for the layperson or college student that treats the solar system as a whole, instead of planet by planet, by disciplinary approach. The coverage is descriptive and nonmathematical, with the first three chapters presenting background and definition-type material. Throughout the text, questions (often with answers given right there) highlight much of the information.

Harvard-Smithsonian Center for Astrophysics. *Comets.* Harvard-Smithsonian Center for Astrophysics, 1974. 15pp. B/w photos and diagrams. Glossary. Secondary and adult.

A short, illustrated history for the public of "astronomy's most spectacular sights," ending with a guide to photographing comets.

_______. *Meteorites.* Harvard-Smithsonian Center for Astrophysics. 20pp. B/w photos and diagrams. Glossary. Secondary and adult.

A brief look at the origin, chemical composition, and night-sky display of meteoroids that enter Earth's atmosphere. Meteorite hunters are told what to look for, how to test whether a find is truly a meteorite, and how to make an official report of the discovery.

Harvey, Dodd L., and Linda C. Cicoritti. *U.S.-Soviet Cooperation in Space.* Monographs in International Affairs of the Center for Advanced International Studies. U. of Miami, 1974. LC# 74-98948. ISBN 0-933074-27-1. 408pp. Index. Bibliography. Foreword by former ambassador to the USSR, Roy D. Kohler. Adult.

Describes Soviet policy in terms of their goals as a nation. This study includes a history of Soviet-American relationships regarding space in terms of the documents generated, the negotiations leading to them, the changing political situations, and the prognosis. An extensive bibliography covers the years 1955 to 1973.

Hayes, William C., Jr., editor. *Space—New Opportunities for International Ventures.* Vol. 49 in the AAS Science and Technology series. AAS, 1980. Hardcover ISBN 0-87703-124-X. Paperbound ISBN 0-87703-125-8. 290pp. B/w photos and diagrams. Adult.

Proceedings of the Seventeenth Goddard Memorial Symposium, held in Washington, D.C., in 1979, at which the internationalism of space development was emphasized. The Director General of the European Space Agency sounded a warning: "man becomes less generous to his fellows the nearer he approaches to a profitable enterprise which he can successfully exploit alone." The other speakers pointed out current space programs that have international opportunities or anticipated planned multi-nation ventures.

Haymes, Robert C. *Introduction to Space Science.* Wiley, 1971. LC# 78-140550. ISBN 0-471-36500-9. 556pp. B/w photos and diagrams. Index.

This textbook for a one-year course incorporates many different areas that are important to understanding our space environment: physics, chemistry, geology, astronomy, mathematics, atmosphere, and so on. There is very little coverage of the actual technology of space exploration.

Heaps, Leo. *Operation Morning Light: Terror in Our Skies. The True Story of Cosmos 954.* Paddington, 1978. LC# 78-16614. Hardcover ISBN 0-448-22425-9. Paperbound ISBN 0-345-28101-2 from Ballantine. 208pp. B/w photos. Index. Adult.

In December 1977, a Soviet spy satellite, one of hundreds in orbit that are constantly watched from Earth, began to malfunction and was clearly going to leave orbit and crash to Earth. Carrying one hundred pounds of enriched uranium-235, it was a danger wherever it landed. This book relates in fiction-like detail the search for the satellite after it finally crashed in the remote snows of northern Canada.

Heiserman, David L. *Radio Astronomy for the Amateur.* Tab Books, 1975. LC# 74-33624. Hardcover ISBN 0-8306-5714-2. Paperback ISBN 0-8306-4714-7. 252pp. B/w diagrams. Index. Secondary and adult.

Working on the assumption that the reader has mastered the basic skills of circuit construction, the author introduces general and radio astronomy, both theory and technology. He then describes projects the amateur experimenter can carry out, such as a simple radio telescope, interferometer system, mapping projects, and even a complete solar radio observatory.

Hellman, Hal. *Communications in the World of the Future.* Revised edition. World of the Future series. M. Evans, 1975. LC# 74-79983. ISBN 0-87131-166-6. 186pp. B/w photos and diagrams. Index. Upper and secondary.

An imaginative but reality-based descriptive study of the future possibilities in communications, from personal computers to full use of satellites. Both history and current technology are covered.

________. *Energy in the World of the Future.* World of the Future series. M. Evans, 1973. LC# 72-90980. ISBN 0-87131-123-2. 240pp. B/w photos and art. Index. Upper and secondary.

A look at today's growing energy problems and the possible solutions, some of which must be put into effect very soon. The solutions presented are fully based on history and current technology and include solar, geothermal, wind, and wave.

________. *Transportation in the World of the Future.* Revised edition. World of the Future series. M. Evans, 1974. LC# 73-68220. ISBN 0-87131-155-0. 188pp. B/w photos and art. Index. Bibliography. Upper and secondary.

Describes the real possibilities for revolutionary transportation facilities—ground methods, people movers, personal urban travel, VTOLs, and hypersonic transports.

Henbest, Nigel. *The Exploding Universe.* Macmillan, 1979. LC# 79-10103. ISBN 0-02-550920-9. 217pp. Color and b/w photos and art. Index. Glossary. Secondary and adult.

How new discoveries have changed our view of stars, galaxies, planets, black holes, pulsars, quasars, quarks . . . and the universe itself, all fully and simply discussed for the layperson. Numerous illustrations augment the text, clarifying concepts. The minute chemicals that play a role in life are as important as the "Big Bang" itself in this book.

Henderson, Arthur, Jr., and Jerry Grey, editors. *Exploration of the Solar System.* NASA EP-122. US GPO, 1974. Stock no. 3300-00581-4. 72pp. B/w photos and diagrams. Glossary. Secondary and adult.

Reprint of an American Institute of Aeronautics and Astronautics Review, prepared by members of the AIAA Technical Committees on Space Systems and Space and Atmospheric Physics. It outlines the potential achievements of this exploration and suggests a course of action to maximize the rewards to mankind. It also provides under one cover a sourcebook on the solar system updated by the space program and the technology involved in its exploration.

Hendrickson, Walter B., Jr. *Manned Spacecraft to Mars and Venus: How They Work.* How It Works series. Putnam, 1975. LC# 74-16627. Trade ISBN 0-399-20438-5. Library binding ISBN 0-399-60928-8. 128pp. B/w photos. Index. Intermediate and upper.

A speculative book that builds on the reality of space program technology and history to propose how astronauts might someday go to our nearest planetary neighbors. The techniques to reach them and what might reasonably be expected to be the process are described.

________. *Who Really Invented the Rocket?* Revised edition. Who Really Invented series. Putnam, 1974. LC# 73-189238. ISBN 0-399-60852-4. 128pp. B/w photos. Index. Intermediate and upper.

A straightforward history of rocketry that attributes "invention" to a whole series of experimenters since Hero developed his aeolipile. Attention is given to, among others, Goddard, Oberth, World War II German rocketry, and post-war division of "the spoils."

Heppenheimer, T. A. *Colonies in Space.* Stackpole, 1977. LC# 76-56187. Hardcover ISBN 0-8117-0397-5. Paperbound ISBN 0-466-81581-0 from Warner. 224pp. Color art and b/w photos and drawings. Index. Bibliography. Introduction by Ray Bradbury. Secondary and adult.

A planetary scientist presents a detailed and imaginative plan for human colonization of space. In a well-illustrated and comprehensive volume, the author clarifies technical concepts in such a way as to present a compelling argument for moving outward from our planet. He concludes with a far future when we will colonize the stars.

________. *Toward Distant Suns.* Stackpole, 1979. LC# 79-16857. ISBN 0-8117-1578-7 256pp. Color and b/w photos, art by Don Dixon. Index. Bibliography. Foreword by Gerard K. O'Neill. Secondary and adult.

This planetary scientist shows "a bold, new prospectus for human living in space," away from the planet that gave us birth. We have the dreams, and the energy crisis may make space appealing. We even have the plans for large space structures. He goes on to describe the way space colonization may develop, with robot workers, industrialization of the Moon, tourism, and even honeymoons in space.

Herman, John R., and Richard A. Goldberg. *Sun, Weather, and Climate.* NASA SP-426. US GPO, 1978. Stock no. 3300-00747-7. 360pp. B/w diagrams. Index. Bibliography. Adult.

Addresses the scientific questions that may lead to a better understanding of the Sun's influence on Earth's weather and climate by reviewing the literature on the subject and suggesting areas that could benefit from research.

Hesse, Walter H. *Our Evolving Universe.* Dickenson, 1977. LC# 76-27551. ISBN 0-8221-0184-X. 481pp. B/w photos and art. Index. Glossary. Adult.

This textbook for the nonscience student opens and closes with discussion of the possibility of life elsewhere in the universe. Otherwise it follows the traditional pattern of astronomical history and techniques, our solar system, the stars, the galaxies, and cosmology. The discoveries of the space program are included throughout but not the technology. Each chapter concludes with a summary, questions, and suggestions for further reading. Observation of stars, constellations, and planets is covered in appendixes.

Hey, J. S. *The Radio Universe.* Revised edition. International Popular Science series. Pergamon, 1975. LC# 75-23134. Hardcover ISBN 0-08-018760-9. Paperbound ISBN 0-08-018761-7. 264pp. B/w photos and diagrams. Index. Secondary and adult.

A semitechnical survey of the history, development, and current status of radio astronomy. The sources of radio signals in the solar system and universe are described, along with how radio signals enhance our knowledge of the universe. No mathematics specialization is required by the reader.

Hey, Nigel S. *How We Will Explore the Outer Planets.* Putnam, 1973. LC# 72-80342. Trade ISBN 0-399-20269-2. Library binding ISBN 0-399-60763-3. 160pp. B/w photos. Index. Glossary. Upper and secondary.

Beyond Mars lies the greatest part of "the real estate of our solar system" and the most mystery to which answers are sought. The author describes the techniques for reaching that region: gravity assist, powerplant needs, rocket capabilities, and navigation techniques. The outer planets themselves are then described.

________. *The Mysterious Sun.* Putnam, 1971. LC# 71-136786. ISBN 0-399-60482-0. 160pp. B/w photos and art. Index. Upper and secondary.

A quite comprehensive but elementary study of our Sun and its influence on our daily lives. Using its energy, understanding its behavior, exploring its emissions and radiations—these are some of the activities concerning scientists, especially in the space program.

Hickok, Floyd. *Handbook of Solar and Wind Energy.* Cahners, 1975. LC# 75-22495. ISBN 0-8436-0159-0. 125pp. B/w photo and art. Adult.

This paperbound "Cahners Special Report" is a basic introduction to two of the primary non-fossil energy sources, the current state of the art, and the probable path of the future.

Hirsch, Richard, and Joseph John Trento. *The National Aeronautics and Space Administration.* #35 in the Praeger Library of U.S. Government Departments and Agencies. Praeger, 1973. LC# 73-2920. 246pp. B/w photos. Index. Secondary and up.

Describes the international situation leading to creation of NASA, how it is organized, and what it has accomplished. The book also looks at the agency's relationship to other government agencies, involvement in international programs, the controversies, and the technological spinoff. Appendixes describe career potential and summarize the aerospace activities of all other nations.

Hoke, John. *Solar Energy.* Revised edition. An Impact Book. Watts, 1978. LC# 77-16828. ISBN 0-531-01329-4. 90pp. B/w photos. Index. Glossary. Upper and secondary.

This book starts where solar energy starts, out in space, where the Sun's energy has been converted to electricity to run satellites and other spacecraft. Then, bringing the subject down to Earth, it presents solar heating of homes, wind power, and finally a series of solar energy projects that use easily available materials. Photos of the finished results are shown.

Holder, William G., and William D. Siuru, Jr., *Skylab: Pioneer Space Station.* Rand McNally, 1974. LC# 74-2484. Trade ISBN 0-528-82556-9. Library binding ISBN 0-528-82557-7. 128pp. Color and b/w photos. Index. Intermediate and upper.

"A doorway into the future," the authors call Skylab. In this illustrated presentation, the why and how of Skylab are discussed and its long period of serving as a home in orbit is described: experiments, repairs, and just living, with most of the detail coming from the first two missions.

Holman, Mary A. *The Political Economy of the Space Program.* No. 1 in Science and Technology Management series. Pacific Books, 1974. LC# 79-180902. ISBN 0-87015-199-1. 398pp. Index. Bibliography. Foreword by George E. Mueller, former NASA Associate Administrator. Adult.

An analysis of the largest peace-oriented technological program ever undertaken by the United States—the exploration of space. The scope of the analysis ranges from a global view of the space program, to the space program as a tool of general social policy, and to the distortion effects of the space program on the communities, labor markets, and aerospace companies.

Holz, Robert K., editor. *The Surveillant Science: Remote Sensing of the Environment.* Houghton Mifflin, 1973. LC# 72-7922. ISBN 0-395-14041-2. 390pp. B/w photos and drawings. Adult.

A fairly technical but basic introduction to remote sensing in a collection of papers starting with the elements of the electromagnetic spectrum and essentials of remote sensing as a technique, then moving on to detail specific parts and uses of the spectrum. A final section deals with social implications of the technique.

Howard, Sam. *Communications Machines.* Raintree, 1980. LC# 79-27718. ISBN 0-8172-1335-X. 32pp. Color photos. Index. Glossary. Primary.

The simple act of conveying information to many people is today the work of complicated machines, shown here in large color photos and brief text. Telephone systems, presses, radio, television, and communications satellites are included.

Hoyle, Fred. *Astronomy and Cosmology: A Modern Course.* Freeman, 1975. LC# 74-28441. ISBN 0-7167-0351-3. 711pp. Color photos, b/w photos and diagrams. Index. Glossary. Adult.

This author develops a basic astronomy textbook with more emphasis on astronomy as a branch of physics than is usually the case. The volume is divided into six major sections, each with its own technical-data appendixes and references. The sections are: 1) A First Look at the Universe, 2) Basic Ideas and Instruments, 3) Astrophysics, 4) The Solar System, 5) Radio Astronomy, and 6) Cosmology. The chapters conclude with "general problems and questions."

________. *Highlights in Astronomy.* Freeman, 1975. LC# 75-1300. Hardcover ISBN 0-7167-0355-6. Paperbound ISBN 0-7167-0354-8. 179pp. Color and b/w photos, diagrams. Index. Secondary and adult.

A book that can serve as an introductory textbook or as a supplementary reading volume, it describes what is happening in astronomy regarding the Earth, solar system, stars, universe, and quest for life in the universe. Full-color photos enhance the text. The section on the solar system disregards Pluto as a planet and calls it a moon escaped from Neptune.

________. *Ten Faces of the Universe.* Freeman, 1977. LC# 76-44336. Hardcover ISBN 0-7167-0384-X. Paperbound ISBN 0-7167-0383-1. 207pp. B/w photos and diagrams. Index. Adult.

A look at present knowledge (and opinions) about ourselves and our universe, as viewed through ten different approaches: God's, the physicist's, the mathematician's, the astrophysicist's, the expanding universe, the origin of the universe, nobody's universe, the geophysicist's, the biologist's, and, finally, Everyman's. In the process, the reader acquires a fascinating insight into the thinking of a famed cosmologist.

Hoyle, Fred, and Jayant Narlikar. *The Physics-Astronomy Frontier.* Freeman, 1980. LC# 80-11708. ISBN 0-7167-1160-5. 483pp. Color and b/w photos, diagrams. Index. Glossary. Adult.

A nonmathematical introductory textbook that emphasizes the interplay between physics and astronomy. Its sections correspond to the interaction between particles in the universe. Electrical interaction concerns the electromagnetic spectrum and nonoptical astronomy. Strong and weak interactions concern the evolution of stars. And gravitational interaction involves black holes and cosmology. Each chapter ends with a list of general problems and questions.

Hoyle, Fred, and N. C. Wickramasinghe. *Diseases from Space.* Harper & Row, 1979. LC# 79-3395. ISBN 0-06-011937-3. 196pp. B/w diagrams. Index. Adult.

Continuing their ideas from *Lifecloud* (see below), the authors propose that not only did Earth's life arrive from interstellar space but so, too, did its death—in the form of plagues and other diseases of which the viruses and bacteria reached Earth in comets. They trace several actual epidemics in recent years as well as plagues of the past. Appendixes deal with technical matter on organic material in space.

________. *Lifecloud: The Origin of Life in the Universe.* Harper & Row, 1979. LC# 78-20167. ISBN 0-06-011954-3. 189pp. B/w photos and diagrams. Index. Adult.

An introduction to the idea that life originated from the chemical elements in the space between stars. The authors use new knowledge of interstellar physics and chemistry—but without getting beyond the interested layperson's level—to discuss how far away in space and time the origins of life can be traced and how it reached Earth, as well, probably, as other planets.

Hoyt, William Graves. *Planets X and Pluto.* U. of Arizona, 1980. LC# 79-15665. Hardcover ISBN 0-8165-0684-1. Paperbound ISBN 0-8165-0664-7. 302pp. B/w photos. Index. Bibliography. Foreword by Bart J. Bok. Adult.

A vivid telling of the discoveries of the planets Uranus and Neptune at the turn of the century, as well as predictions that led to the later discovery of Pluto. A concluding chapter discusses the possibility of another planet being beyond Pluto in our solar system. While fairly technical in parts, the excitement of discovery carries the lay reader along.

Hunter, Mark. *Fantastic Journeys: Five Great Quests of Modern Science.* Walker, 1980. LC# 79-52623. ISBN 0-8027-0638-X. 191pp. B/w diagrams. Index. Secondary and adult.

Quests of science fact, not science fiction, get the spotlight. The fascinating scientific journeys, or mysteries with clues scattered along the path, are those to the center of the Earth, search for a lost continent, to the inside of the atom, to the edge of the universe, and to the beginning and end of time in our universe. Many very complex concepts are clarified for the reader.

I

Ingram, Dave. *OSCAR: The Ham Radio Satellite.* Tab Books, 1979. No. 1120. LC# 79-12614. Hardcover ISBN 0-8306-9805-1. Paperbound ISBN 0-8306-1120-7. 140pp. B/w drawings. Secondary and adult.

A basic introduction to amateur radio communications via satellite, plus all the detailed instruction necessary to start your own Earth receiving station.

Institute of Environmental Sciences. *Solar Energy and Its Uses.* Institute of Environmental Sciences, 1976. Color photos and art. Upper and up.

A full-color wallchart that packs in a lot of detail on energy use, the solar energy cycle, solar irradiation, the effect of the atmosphere, solar power satellites, and even an entire town run by solar energy.

Irwin, James B., with William A. Emerson, Jr. *To Rule the Night: The Discovery Voyage of Astronaut Jim Irwin.* Holman, 1973. LC# 73-11410. Hardcover ISBN 0-87981-024-6. Paperbound ISBN 0-8007-8189-9. 268pp. B/w photos. Index. Secondary and adult.

The scientific and spiritual autobiography of the Lunar Module Commander on the Apollo 15 mission. It's a parallel story of his scientific growth and the rediscovery of his spiritual faith.

Irwin, Mary, with Madalene Harris. *The Moon is Not Enough: An Astronaut's Wife Finds Peace with God and Herself.* Zondervan, 1978. LC# 78-5395. ISBN 0-310-37050-7. 176pp. B/w photos. Secondary and adult.

The astronauts' wives are not perfection cast in marble, as the TV cameras often seemed to show. This personal story of the wife of the Apollo 15 Commander tells of her trials in the public eye and in her private heart.

J

Jaber, William. *Exploring the Sun.* Messner, 1980. LC# 80-10985. ISBN 0-671-32997-9. 93pp. B/w photos and art. Index. Glossary. Intermediate and upper.

This introduction to our Sun starts with the useful warning NEVER to look directly at the Sun. Then it explores the history of solar astronomy, explaining its light, structure, activity, and life-giving properties.

Jackson, Joseph H. *Pictorial Guide to the Planets.* Revised edition. Crowell, 1973. LC# 72-7573. ISBN 0-690-62443-3. 248pp. Color and b/w photos, diagrams. Bibliography. Index. Secondary and adult.

A well-illustrated guide to our solar system, stretching from our surface outward. The volume also takes a thorough but nontechnical look at planetary atmospheres, interplanetary space, and the equipment and programs involved in studying the solar system. Tables are used to highlight data on the planets, asteroids, meteors, and spaceflight.

Jacobs, Kenneth Charles. *Extragalactic Astronomy: The Universe Beyond Our Galaxy.* NASA EP-129. US GPO, 1977. Stock no. 3300-00657-8. 48pp. B/w photos and diagrams. Glossary. Secondary and adult.

A booklet prepared in cooperation with the American Astronomical Society for use by secondary school science teachers. The nontechnical booklet introduces the student to the exciting discoveries of modern astronomy beyond the Milky Way galaxy, including: extragalactic radio sources, exploding galaxies, quasars, cosmic microwave background radiation, and extragalactic X-ray sources. Questions with answers and advanced exercises are suggested. The other three booklets in the group are: Blanchard, *Atoms in Astronomy;* Gammon, *Chemistry Between the Stars;* and Straka, *The Supernova.*

Jacobs, Lou, Jr. *By Jupiter: The Remarkable Journey of Pioneer 10.* Hawthorn, 1975. LC# 74-15640. ISBN 0-8015-0992-0. 108pp. B/w photos and diagrams. Index. Glossary. Foreword by Robert S. Kraemer, NASA Director of Planetary Programs. Intermediate and upper.

An account of the planning and development of a craft to explore the outer solar system. The journey's beginning is described, as is the way its instruments work. The future of the craft itself and of planetary exploration is discussed for young people.

________. *Space Station Eighty.* Hawthorn, 1973. LC# 73-5444. ISBN 0-8015-6984-2. 111pp. B/w photos. Index. Intermediate and upper.

From a starting point of the difficulty-ridden launch of Skylab in 1973, the author describes the programs of relevance to people making long stays in space, such as in Space Shuttle. The requirements as well as what life would be like aboard hypothetical Space Station '80 are described.

Jaffe, Leonard, editor. *Satellite Communications in the Next Decade.* Vol. 44 in the AAS Science and Technology series. AAS, 1977. ISBN 0-87703-088-X. 177pp. B/w diagrams. Adult.

Proceedings of the Fourteenth Goddard Memorial Symposium, held in Washington, D.C., in 1976, including a panel discussion on the main topic. Papers presented dealt with the coming technology needs for the 1980s, space transportation, national and international issues, and the telecommunications market.

James, Peter N. *Soviet Conquest from Space.* Arlington House, 1974. LC# 73-22457. ISBN 0-87000-224-4. 256pp. B/w photos. Index. Secondary and adult.

An expert in assessing Soviet aerospace capabilities, the author explains in lay language why he thinks that the Soviet method of space and military development has put that nation far ahead of the United States. He describes what the Soviet capability appears to be and contrasts it with American technology.

Jastrow, Robert. *God and the Astronomers.* Norton, 1978. LC# 78-110972. ISBN 0-393-01187-9. 136pp. Color and b/w photos. Index. Secondary and adult.

Explores for the thoughtful layperson the gradual discovery and acceptance that the universe did indeed have a specific beginning, a moment of creation. A renowned astronomer and religious skeptic looks at the astronomers who gathered the evidence and how they reacted to it. Includes many rare photos of the astronomers at work and insights into their own humanity.

________. *Red Giants and White Dwarfs: Man's Descent from the Stars.* Revised edition. Harper & Row, 1979. LC# 79-108939. ISBN 0-06-01281-5. 191pp. B/w photos and diagrams. Index. Secondary and adult.

Dr. Jastrow's now-classic book describes, in enlivening lay language, the scientific view of the creation of the universe and the millions of years of change leading to humanity. The new edition incorporates material derived from man's look at Moon rocks, Mars, and Venus, as well as the discoveries relating to stars.

________. *Until the Sun Dies.* Norton, 1977. LC# 77-5613. ISBN 0-393-06415-8. 172pp. B/w photos and diagrams. Index. Secondary and adult.

The director of NASA's Goddard Institute for Space Studies explores the meaning of the latest discoveries in astronomy and space (such as the Viking landing on Mars) to our understanding of the riddle of life and the riddle of creation. In essence, the book is a continuation of the author's *Red Giants and White Dwarfs.* Separate photo sections use pictures and long captions to highlight the birth of the universe, the history of life, and the origin of mankind.

Jastrow, Robert, and Malcolm H. Thompson. *Astronomy: Fundamentals and Frontiers.* Third edition. Wiley, 1977. LC# 76-46622. ISBN 0-471-01845-7. 532pp. Color and b/w photos, diagrams. Index. Glossary. Study Guide available: ISBN 0-471-03035-X. Instructor's Resource Manual available. Adult.

With no technical jargon or complicated mathematics, this complete updated text by a NASA-associated astronomer covers three major topics after establishing the position of Earth in space: stars, galaxies, and the solar system. It concludes with a discussion of the question of life elsewhere in the cosmos.

Jespersen, James, and Jane Fitz-Randolph. *From Sundials to Atomic Clocks: Understanding Time and Frequency.* National Bureau of Standards monograph 155. US GPO, 1977. Stock no. 003-003-01650-1. LC# 77-600056. 175pp. Two-color art by John Robb. Index. Upper and secondary.

A descriptive study for the public from the accurate timekeeper of America. Simple text and cartoon-like illustrations are used to discuss the riddle of time, man-made clocks and watches, finding and keeping time, the uses of time, and time science and technology.

________. *Time and Clocks for the Space Age.* Atheneum, 1979. LC# 79-14578. ISBN 0-689-30710-1. 179pp. B/w photos and diagrams. Index. Glossary. Upper and secondary.

A readable, interesting explanation of how man developed the concept of time, learned to measure it, and then to use it for navigation. Today's clocks use radio frequencies and atomic vibrations to maintain accuracy. Communications, computers, aerial navigation, and even travel to the planets depend in part on accurate time-keeping . . . at least until time and space themselves begin to do strange things.

Jobb, Jamie. *The Night Sky Book: An Everyday Guide to Every Night.* A Brown Paper School Book. Little, Brown, 1977. LC# 77-24602. Hardcover ISBN 0-316-46551-8. Paperbound ISBN 0-316-46552-6. 127pp. B/w photos and art by Linda Bennett. Intermediate.

Charming line drawings and hand-lettered instructions for activities highlight this informal introduction to the night sky. Considerable astronomical knowledge is built into the five chapters: North and Night, Sphere and Here, Noon and Moon, Planets and Orbits, and Star and Light.

John, Laurie, editor. *Cosmology Now.* Taplinger, 1976. LC# 76-15091. ISBN 0-8008-1925-X. 168pp. B/w photos and diagrams. Index. Introduction by Sir Bernard Lovell. Adult.

Quasars, pulsars, black holes, the infinite number of other galaxies—these are the subjects of this book based on a series of BBC lectures. Nine astronomers and a philosopher explain what is now known about our universe and the basic laws of nature.

Johnson, Francis S., editor. *International Congress of Space Benefits.* Vol. 30 in the AAS Advances in the Astronautical Sciences series. AAS, 1974. LC# 57-43769. ISBN 0-87703-065-0. 516pp. B/w photos and diagrams. Adult.

Proceedings of the Nineteenth Annual AAS Meeting, held in Dallas, Texas, in 1973. The program detailed the ways in which benefits of space activity are increasingly being felt (or enjoyed without being noticed) and how human affairs are undergoing change because of these benefits. Areas covered by the papers included: 1) Spectrum of Opportunity, 2) Communications and Data Management, 3) Technology, and 4) Resource Management and Assessment.

Johnson, Nicholas L. *Handbook of Soviet Lunar and Planetary Exploration.* Vol. 47 in the AAS Science and Technology series. AAS, 1979. Hardcover ISBN 0-87703-105-3. Paperbound ISBN 0-87703-106-1. 262pp. B/w photos and diagrams. Index. Adult.

A technological history of the USSR's program to explore the Moon and planets, detailing and illustrating to the extent possible the Luna, Kosmos, and Zond probes of the Moon, Venera and other Kosmos looks at Venus, and Mars and Zond flights to Mars. Each chapter concludes with complete references.

________. *Handbook of Soviet Manned Space Flight.* Vol. 48 in the AAS Science and Technology series. AAS, 1980. Hardcover ISBN 0-87703-115-0. Paperbound ISBN 0-87703-116-9. 461pp. Index. Bibliography. B/w photos and drawings. Adult.

A detailed chronological history of the manned spaceflight program by the USSR with only slight technical detail, based, whenever possible, on Russian-language documents. The technology and flight events are included for Vostok, the one-man (as well as one-woman) craft; Voskhod, two- or three-man; Soyuz, the general-purpose workhorse craft, perhaps originally intended for a lunar program similar to Apollo; and the Salyut space station, used for both military and civilian purposes and reached by Soyuz. Appendixes list Soviet launch vehicles, facilities, and manned missions.

Johnson, Richard D., and Charles Holbrow, editors. *Space Settlements: A Design Study.* NASA SP-413. US GPO, 1977. Stock no. 3300-00669-1. 185pp. Color and b/w art. Secondary and adult.

Devoted to engineering systems that might permanently sustain human life in space on a large scale, this book is by participants in the 1975 Summer Faculty Fellowship Program in Engineering Systems Design. The papers included cover: the settlement of space, physical properties of space, human needs in space, choosing among alternatives, a tour of the settlement, building the settlement and making it prosper, and view to the future.

Johnson, Richard S., Albert Naumann, Jr., and Clay W. G. Fulcher, editors. *The Future United States Space Program.* Vol. 38, Parts I and II, in the AAS Advances in the Astronautical Sciences series. AAS, 1979. LC# 57-43769. Vol. I ISBN 0-87703-098-7. Vol. II ISBN 0-87703-099-5. 839pp. total. B/w photos and diagrams. Adult.

Proceedings of the AAS Twenty-fifth Anniversary Conference held in 1978 in Houston, Texas. Numerous papers were presented revealing both plans and dreams in eleven major subject areas: 1) Space—the Arena for Change, 2) Optimization and Numerical Methods, 3) Space Guidance, 4) Projected Space Applications, 5) Space Science, 6) Social Aspects of Space, 7) Frontiers of Space Law, 8) Economics, 9) Space Medicine, 10) Future Programs and Prospects, and 11) Engineering in the 21st Century.

Johnston, Richard S., and Lawrence F. Dietlein, editors. *Biomedical Results from Skylab.* NASA SP-377. US GPO, 1977. Stock no. 3300-00648-9. 508pp. Color photos, b/w diagrams. Index. Adult.

A comprehensive and detailed presentation of biomedical results of the three Skylab manned space station missions. Among subjects covered are cardiovascular, mineral, fluid, musculoskeletal, immunological, cytological, hemotological, neurological, and vestibular findings. This interesting, illustrated book includes many observations made by the crews themselves. Much of what was learned on Skylab will be important in coming years both on Earth and in space.

Jonas, Doris and David. *Other Senses, Other Worlds.* Stein & Day, 1976. LC# 75-11816. Hardcover ISBN 0-8128-1841-5. Paperbound ISBN 0-8128-2471-7. 240pp. Index. Secondary and adult.

Two scientists (an anthropologist and a psychiatrist) speculate about the nature of extraterrestrial beings, based on the considerable diversity evidenced on Earth and the known facts about the environments on other planets. The beings they conjure up provide all the wonder of the most outrageous science fiction while remaining within the realm of possibility.

Jones, Marvin. *Space Awareness.* Florida Department of Education. Bulletin 71-F-5. 231pp. B/w photos and drawings. Glossary. Secondary and adult.

A curriculum resource guide developed for Florida teachers in adult education that can serve as a basic guide for any group's introduction to the U.S. space program, its history, technology, and impacts. Each unit includes a pre-assessment, objectives, and content outlines, and concludes with a Space Awareness vocabulary, suggestions for the teacher, a resource list including text materials and films, and a post-assessment.

Joseph, Joseph Maron, and Sarah Lee Lippincott. *Point to the Stars.* Revised edition. McGraw-Hill, 1977. LC# 76-53737. ISBN 0-07-033050-6. 96pp. B/w photos and diagrams. Index. Glossary. Intermediate and upper.

A basic introduction to observing the stars by the constellations in which they appear, with the unusual addition of a chapter on observing artificial satellites. Stars are identified as visible with the naked eye, with binoculars, or with telescope. Along with diagrams of the constellations, photos of other phenomena associated with them are shown, such as the Crab Nebula in Taurus and Horsehead Nebula in Orion.

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Kaplan, Marshall H. *Space Shuttle: America's Wings to the Future*. Aero Publishers, 1978. LC# 78-10930. ISBN 0-8168-8450-1. 215pp. Color and b/w photos and art. Index. Glossary. Foreword by astronaut L. Gordon Cooper. Secondary and adult.

The new space transportation system of the near future is under way. The author explores, with full illustration, how it got started, what its tasks will be, what its meaning will be back on Earth, and its implications for the future. Appendixes include information for model builders and material on the first Shuttle astronaut candidates.

Kaufman, Joe. *About the Big Sky, about the High Hills, about the Rich Earth . . . and the Deep Sea*. Golden Press, 1978. LC# 77-82664. Hardcover ISBN 0-307-66805-3. Paperbound ISBN 0-307-16805-0. 70pp. Color art by the author. Primary and intermediate.

A casual, humorous, and colorful approach to many of the questions young children have about the world around them. Some of the subjects covered are stars, planets, solar energy, the Moon, weather, Earth's structure and environments, and the future.

Kaufmann, William J., III. *Astronomy: The Structure of the Universe*. Macmillan, 1977. LC# 75-31505. ISBN 0-02-362130-3. 491pp., plus star charts. Index. Glossary. Adult.

A nonmathematical textbook for nonscience majors that puts strong emphasis on the new frontiers that astronomy has reached in recent years. Because the author regards the solar system as the province of a separate science, planetary physics, only one chapter is devoted to the subject. Also not traditional is the emphasis given to the special and general theories of relativity. Each chapter concludes with straightforward questions and exercises.

_______. *Black Holes and Warped Spacetime*. Freeman, 1979. LC# 79-18059. Text edition ISBN 0-7167-1153-2. Paperbound ISBN 0-553-13749-2 from Bantam. 240pp. Color and b/w photos, diagrams. Index. Adult.

A treatment for the interested layperson or student of the evolution of stars, the prediction that extraordinary ex-stars called black holes exist, and the search for evidence of their existence. The diagrams and photos are very helpful.

_______. *Exploration of the Solar System*. Macmillan, 1978. LC# 77-5543. ISBN 0-02-362140-0. 575pp. Color and b/w photos, diagrams. Index. Glossary. Adult.

A textbook for nonscience majors who want to concentrate on Earth and its vicinity rather than all of the universe. Because the space program has revolutionized planetary science, much of this text justifiably concentrates on the techniques and discoveries of the various planetary missions. Although this has the usual facets of a textbook such as chapter review questions, it can serve as a useful volume for any layperson seeking an up-to-date volume on our solar system.

_______. *Galaxies and Quasars*. Freeman, LC# 79-10570. Hardcover ISBN 0-7167-1137-8. Paperbound ISNB 0-7167-1134-6. 226pp. B/w photos and diagrams. Index. Bibliography. Adult.

A view of cosmology in light of recent events in astronomy: discoveries about galaxies, the red shift, quasars, and black holes. The course followed by the author clarifies difficult concepts.

_______. *Planets and Moons*. Freeman, 1979. LC# 78-21156. Hardcover ISBN 0-7167-1041-2. Paperbound ISBN 0-7167-1040-4. 219pp. B/w photos and diagrams. Index. Bibliography. Adult.

Text or leisure reading about what we know from our recent travels through the solar system. Each planet is treated in an individual chapter except for the planets from Saturn outward, which are grouped. Such interplanetary vagabonds as comets and meteoroids are also discussed. An appendix contains planetary and satellite data.

_______. *Relativity and Cosmology*. Revised edition. Harper & Row, 1977. LC# 76-41868. ISBN 0-06-043572-0. 150pp. B/w art. Index. Glossary. Secondary and adult.

A description for the layperson of some of the puzzles of contemporary astronomical research. It deals with experiments that demonstrate the validity of general relativity and introduces the shape and structure of the universe.

_______. *Stars and Nebulas*. Freeman, 1978. LC# 78-17544. Hardcover ISBN 0-7167-0081-6. Paperbound ISBN 0-7167-0085-9. 204pp. Color and b/w photos and diagrams. Index. Bibliography. Secondary and adult.

Stars and the clouds of "starstuff" called nebulas are the basic matter of astronomy. This semitechnical account of what we know about them and how we know it carries the reader through complex subjects. Final chapters are devoted to pulsars and neutron stars, as well as black holes. Monthly star charts are included.

Kent, Stan, editor. *Remember the Future—The Apollo Legacy*. Vol. 50 in the AAS Science and Technology series. AAS, 1980. Hardcover ISBN 0-87703-126-6. Paperbound ISBN 0-87703-127-4. 208pp. B/w photos and diagrams. Secondary and adult.

Proceedings of a meeting held in San Francisco in July 1979, which asked participants: "Rather than fall into the trap of dwelling upon past achievements commemorate Apollo 11 by remembering the future. We ask you to take one bold step into that special realm of the universe in which you will spend the rest of your life: The Future." Among the many subjects presented in nontechnical fashion are orbiting mirrors, space colonies, astronaut stress, advanced rocket engines, cosmic migration, and the search for extraterrestrial intelligence.

Kerola, Dana Xavier. *Ultimate Commune: The Universe and Us*. Exposition Press, 1979. LC# 79-50828. ISBN 0-682-49312-0. 82pp. Bibliography. Secondary and adult.

An astronomer who grew up in the years of hippie communes, the author of this small but wide-ranging book explains the fundamental essence of our universe, this "ultimate commune' we find ourselves inextricably living in." Even the words of rock songs are used to expand the reader's perspective on the cosmos.

Kerrod, Robin. *The Challenge of Space*. A Question and Answer Book. Lerner, 1980. LC# 79-64385. ISBN 0-8225-1177-0. 36pp. Color art. Index. Glossary. Intermediate.

The Question and Answer Books are described as containing "the questions YOU ask—answered in pictures and words." This one is a basic book of space exploration and science: what is space like? how does a satellite work? how did people survive? Brief coverage of the main American and Soviet programs is included. The book ends with a glossary of space words and famous rockets and satellites.

________. *Mission Outer Space*. A Question and Answer Book. Lerner, 1980. LC# 79-64388. ISBN 0-8225-1180-0. 36pp. Color art. index. Intermediate.

Our solar system is becoming familiar territory even to young readers. This book asks the obvious questions about each planet, how we have and will continue to explore it remotely, and the probabilities of man going to it. The myths as well as the factual discoveries are included. The book ends with questions about life elsewhere in the universe.

________. *The Mysterious Universe*. A Question and Answer Book. Lerner, 1980. LC# 79-2345. ISBN 0-8225-1181-9. 36pp. Color art. Index. Glossary. Intermediate.

The questions about our Earth in space and the entire realm beyond are answered in large, colorful illustrations and brief text. The book ends with the techniques of astronomy, including space exploration. A short who's who of astronomers is added.

________. *Race for the Moon*. A Question and Answer Book. Lerner, 1980. LC# 79-2347. ISBN 0-8225-1183-5. 36pp. Color art. Index. Intermediate.

Answers in text and large, dramatic, full-color art the questions that children ask (as well as some they probably don't think of) about the Moon, the men who went there, how they got there, and when we might inhabit it. A full chronology of American manned space flights through Apollo is shown at the end.

________. *See Inside a Space Station*. See Inside series, edited by R. J. Unstead. Warwick, 1978. LC# 78-66168. Trade ISBN 0-531-09136-8. Library binding ISBN 0-531-09122-8. 32pp. Color photos and art. Index. Glossary. Intermediate.

The stage for permanent space stations in orbit was set by the American Skylab and Soviet Salyut space stations. Space Shuttle will provide the basic tool for turning modules into a larger space station. The Shuttle, Spacelab, life in a station, mission control, and future space cities are illustrated and discussed briefly.

________. *Stars and Planets*. An Arco Fact Guide in Color. Arco, 1979. LC# 79-13254. ISBN 0-668-04806-9. 125pp. Color photos and art. Glossary. Upper and secondary.

A thoroughly illustrated pocket-sized guide to astronomy, including star maps, planetary photos, and key dates in astronomy. Numerous topics are touched on briefly but colorfully.

________. *The Universe*. Visual World Library series. Warwick, 1976. LC# 76-14784. Trade ISBN 0-531-02449-0. Library binding ISBN 0-531-01201-8. 160pp. Color photos and art. Index. Glossary. Secondary and adult.

A comprehensively illustrated guide to the universe, its scale, forces, evolution, and structure. The astronomers of the past and the work of the present are introduced. Equal emphasis is given to the methods of astronomy and space exploration and to the body of knowledge being increased. There are major sections on rocketry, satellites, and manned space flights.

Kiefer, Irene. *Energy for America*. Atheneum, 1979. LC# 79-14656. ISBN 0-689-30713-6. 199pp. B/w photos and diagrams. Index. Glossary. Intermediate and upper.

A view for young people of how America got into an energy problem, the alternative sources from Sun, Earth, and atomic nucleus, as well as the experiments currently being done. The heavy use of photographs gives an immediacy to the topics discussed.

Kildow, Judith Tegger. *Intelsat: Policy-Maker's Dilemma*. Studies in International Relations and Foreign Policy series. Lexington Books, 1973. LC# 73-1585. ISBN 0-669-86652-0. 118pp. Index. Bibliography. Adult.

International telecommunications satellites are not just a useful and interesting next step in the development of easy communication. They are also the subject of considerable debate on how satellites should be used to link the world, what information should be conveyed, and who should control the means. This volume discusses the evolution of U.S. policies and the central issues to be decided.

Killian, James R., Jr. *Sputnik, Scientists, and Eisenhower*. MIT Press, 1977. LC# 77-21560. ISBN 0-262-11066-0. 315pp. Index. Adult.

A memoir by a former president of the Massachusetts Institute of Technology who was the first person to serve as Special Assistant to the President for Science and Technology. This book relates the behind-the-scenes activity that shaped America's policy in the early years of the space program—policy that prevented panic after the launch of Sputnik by the Soviet Union and that kept the program basically a civilian endeavor with research-oriented goals.

Kilmeister, Clive W. *The Nature of the Universe*. World of Science Library. Dutton, 1971. LC# 76-165333. Hardcover ISBN 0-525-16430-8. Paperbound ISBN 0-525-04005-6. 216pp. Color and b/w photos and diagrams. Index. Glossary. Bibliography. Secondary and adult.

Relying heavily on good illustrations, this layperson's guide presents a clear and exciting view of the intricacies of cosmology. Some of the topics clarified are relativity, time and space, and the recent developments of radio astronomy. A concluding chapter presents some of the fascinating and unusual theories on related cosmological subjects.

King, Ivan R. *The Universe Unfolding*. Freeman, 1976. LC# 75-33369. ISBN 0-7167-0521-4. 504pp. Color and b/w photos, diagrams. Index. Adult.

An interestingly written textbook for the non-science major. The author starts with the telescope and our own Earth, then moves outward into the solar system and its planetary motions. Before bringing in the stars and galaxies, he discusses the possibility of life elsewhere in the universe. Throughout, the text shows a deep concern with mankind and our views of the universe, thus history of astronomy and now the space program are incorporated wherever relevant.

Kinsley, Michael E. *Outer Space and Inner Sanctums: Government, Business and Satellite Communications*. Wiley, 1976. LC# 75-26717. ISBN 0-471-48060-6. 280pp. Index. Bibliography. Foreword by Ralph Nader. Secondary and adult.

A study by a law student of the communications satellite program in the United States and his conclusion that the satellite system has been deliberately underplayed because it bites into telephone company profits.

Kitchen, R. F. *First Men on the Moon: Handbook of Stamps*. Vantage, 1976. ISBN 0-533-01957-5. 139pp. B/w photos. General.

In almost total illustration, this book shows the world's Apollo-related commemorative postage stamps. Seventy stamp-distributing units (not all are countries) are represented.

Kleinman, Joel P., editor. *Getting to Know OSCAR from the Ground Up*. American Radio Relay League, 1977. LC# 77-83185. 48pp. B/w photos and diagrams. Index. Secondary and adult.

The basic handbook for radio amateurs who want to communicate through Orbiting Satellites Carrying Amateur Radio (OSCARs), reprinted from articles that originally appeared in *QST*, the ARRL magazine. Part of the cover of the paperbound book is the "Oscarlocator," a polar map with a plastic overlay, used by "hams" to plan their broadcasts and aim their antennas.

Knight, David C. *Colonies in Orbit: The Coming Age of Human Settlements in Space*. Morrow, 1977. LC# 76-56086. Trade ISBN 0-688-22096-7. Library binding ISBN 0-688-32096-1. 96pp. B/w photos and diagrams. Index. Glossary. Intermediate.

Introduction for young people to Gerard K. O'Neill's revolutionary theories about orbiting space colonies—their location, construction, and living environments. Particularly interesting is the chapter on what life in such a colony would be like.

________. *Eavesdropping on Space: The Quest of Radio Astronomy*. Morrow, 1975. LC# 74-19285. Trade ISBN 0-688-22019-3. Library binding ISBN 0-688-32019-8. 128pp. B/w photos and diagrams. Index. Glossary. Upper.

Beginning with a straightforward explanation of wave phenomena, this book describes the history of non-optical astronomy and the instruments used. The major subjects under investigation are explained: radio mapping, quasars and black holes, interstellar molecules, and the search for intelligent signals. It includes good coverage of work done in other countries.

________. *The First Book of Mars*. Revised edition. A First Book. Watts, 1973. LC# 72-8123. ISBN 0-531-00797-9. 85pp. B/w photos and diagrams. Index. Intermediate.

Starting with the early flyby flights to Mars, the author introduces the considerable body of folklore, fiction, and slowly demonstrated fact that surrounded our neighbor before it was visited by the Viking landers.

________. *Galaxies, Islands in Space*. Morrow, 1979. LC# 78-21625. Trade ISBN 0-688-22180-7. Library binding ISBN 0-688-32180-1. 96pp. B/w photos and diagrams. Index. Glossary. Upper.

Introduces the Milky Way and then the other kind of galaxies. An excellent collection of photos shows the variety of star, dust, and gas clusters in the universe. The author concludes with quasars, black holes, and the concept of the expanding universe.

________. *Harnessing the Sun. The Story of Solar Energy.* Morrow, 1976. LC# 75-44301. Trade ISBN 0-688-22070-3. Library binding ISBN 0-688-32070-8. 128pp. B/w photos and diagrams. Index. Glossary. Intermediate and upper.

The past, present, and future of the utilization of energy from the Sun are described and illustrated. Indirect solar energy, such as wind energy and ocean-thermal difference, is also briefly covered.

________. *Let's Find Out About Earth.* Revised edition. Let's Find Out Series. Watts, 1975. LC# 74-350. ISBN 0-531-00017-6. 48pp. Color illustrations by Linda Chen. Primary.

A simple introduction to our Earth as a planet—its shape, position around the Sun, orbital motion, surface, and gravitation. It makes exploration of the solar system quite logical.

________. *The Moons of Our Solar System.* Revised edition. Morrow, 1980. LC# 80-369. Trade ISBN 0-688-22230-7. Library binding ISBN 0-688-32230-1. 128pp. B/w photos, and art by Ellen Cullen. Index. Glossary. Upper.

Previously published as *Thirty-Two Moons,* this updated book now leaves the question of numbers open but looks at the natural satellites of our solar system in the light of recent discoveries, investigating each one by one. The author predicts that the moons of the giant planets may be steppingstones for us to use in looking more closely at the planets themselves.

________. *Tiny Planets: Asteroids of our Solar System.* Morrow, 1973. LC# 72-12946. Trade LSBN 0-688-20072-9. Library binding ISBN 0-688-30072-3. 96pp. B/w photos and diagrams. Index. Glossary. Intermediate.

An account of the history and physical nature of the minor planets located in the huge zone between Mars and Jupiter. This book also speculates on their possible future significance for mankind.

Knight, David C., editor. *American Astronauts and Spacecraft: A Pictorial History from Project Mercury through the Skylab Manned Missions.* Revised edition. Watts, 1975. LC# 78-131143. ISBN 0-531-01963-2. 176pp. Color and b/w photos. Index. Glossary. Intermediate and upper.

A photographic reference, with brief text, to the history of American manned spaceflight: projects Mercury, Gemini, Apollo, and Skylab. Biographies of all the astronauts are given at the end.

Knight, Dennis. *Space Flight.* Third edition. A Dennis Knight Activity Book. Royal Sovereign Group, 1978; dist. by Arthur Schwartz Sales Co. 16pp. Color art. Intermediate and upper.

A brief, colorful look at space exploration, with dramatic art and minimal text. The center spread is artwork of the Moon plus a collection of press-on pictures of vehicles and astronauts that the child can use to create his or her own scene.

Knox, Richard. *Experiments in Astronomy for Amateurs.* St. Martin's, 1976. LC# 75-34748. Hardcover ISBN 0-312-27685-0. Paperbound ISBN 0-312-27686-9. 206pp. B/w diagrams. Index. Secondary and adult.

Starting with a basic look at measuring the rotation of Earth by observation of the Sun, this book introduces practical astronomy with minimal equipment. Some areas covered are telling time by Sun and stars, modeling the celestial sphere, tracking the planets, and the Moon. Each chapter ends with relevant exercises.

________. *Foundations of Astronomy: From Big Bang to Black Holes.* A Halsted Press Book. Wiley, 1979. LC# 79-13. ISBN 0-470-26638-4. 184pp. B/w photos. Index. Bibliography. Adult.

A short treatment for interested, nontechnically minded readers of the current state of astronomical thought about the origin and development of the universe. About half the book deals with our solar system and the rest is on stars and galaxies, concluding with the popular question: "Is anybody out there?"

Kohn, Bernice. *Communications Satellites: Message Centers in Space.* Four Winds Press, 1975. LC# 74-26873. ISBN 0-590-07356-7. 58pp. B/w art by Jerome Kühl. Index. Glossary. Intermediate.

In easy-to-understand language this book begins where space travel does, with the rocketry pioneers who made it possible. Telstar, the synchronous satellite, and Comsat are described, concluding with a brief look at the future. All are illustrated with charming pen-and-ink drawings.

Kondo, Herbert. *The Moon.* Revised edition. A First Book. Watts, 1971. LC# 72-139484. ISBN 0-531-00740-5. 86pp. B/w photos and art. Index. Upper.

A great deal was learned about the Moon in just a few years, culminating in the Apollo lunar landings. Starting with myths and naked-eye observations, this book delves into the Moon's structure, phases, motions, physical character, and effect on Earth. The Apollo Project and the experiments done as a part of it are described.

Kopal, Zdenek. *Man and His Universe.* Morrow, 1972. LC# 74-166343. ISBN 0-688-05014-X. 313pp. B/w photos. Index. Glossary. Adult.

A nontechnical but fairly advanced look at our universe, the people who made discoveries about it, and how they did it. The meaning of their discoveries for us is analyzed. This paperbound book concludes with speculation on life elsewhere in the universe.

________. *A New Photographic Atlas of the Moon.* Taplinger, 1971. LC# 72-125480. ISBN 0-8008-5515-9. 311pp. B/w photos. Index. Glossary. Introduction by Harold C. Urey. Secondary and adult.

This well-illustrated album of the Moon uses NASA photos plus those from the author's own collection. The text discusses the importance of each picture and what it reveals about Earth's natural satellite.

________. *The Realm of the Terrestrial Planets.* A Halsted Press Book. Wiley, 1979. LC# 79-40449. ISBN 0-470-26688-0. 223pp. Color and b/w photos, diagrams. Index. Adult.

The extent of our knowledge about the near planets has ballooned massively since 1959 when the first probe was sent to the Moon. This book updates for the nontechnically minded what we have learned about the Moon, Mercury, Mars, the asteroids, Venus, as well as our own planet. It also shows how we acquired this new view, particularly through the space program.

________. *The Solar System.* Oxford, 1972, LC# 72-96944. Hardcover ISBN 0-19-885061-1. Paperbound ISBN 0-19-888061-8. 152pp. B/w photos and diagrams. Index. Glossary. Secondary and adult.

A summary of what was known in the early 1970s about our solar system. Although specific planets have been investigated further since then, the straightforward discussion is still basically useful and interesting.

Kopp, O. W., et al. *Elementary School Aerospace Activities: A Resource for Teachers.* NASA EP-147. US GPO, 1977. Stock no. 3300-00693-4. 140pp. B/w photos and diagrams. Adult.

A resource for teachers developed from a curriculum project prepared for NASA's Educational Programs office by the University of Nebraska at Lincoln. It is a manual or guide for teachers to use in planning and introducing aerospace developments into the classroom. In addition to a selected bibliography at the end of each of the ten sections, the publication has a list of audiovisual and printed materials in the appendix. Many photos of children carrying out the activities augment the diagrams and descriptions. Section headings include: Earth Characteristics, Flight in the Atmosphere, Rockets, Technological Advances, Unmanned Earth Satellites, Unmanned Exploration of the Solar System, Life-Support Systems, Astronauts, and Projections.

Kraft, Christopher C., Jr. *The Solar Power Satellite Concept: The Past Decade and the Next Decade.* US GPO, 1979. Stock no. 3300-00766-3. 20pp. B/w photos and art. Upper and up.

The Von Karmen lecture presented at the Fifteenth Annual Meeting of the AIAA addressed the proposition, "No other space concept has been presented that offers rewards of such magnitude and importance while simultaneously involving such difficult questions of feasibility and practicability." Kraft discusses the subject of a solar power satellite in terms of system definition, exploratory research, cost, and future activities.

Kraske, Robert. *Is There Life in Outer Space?* Harcourt Brace, 1976. LC# 76-929. ISBN 0-15-239190-8. 86pp. B/w photos. Index. Bibliography. Intermediate and upper.

It is no longer a question of "if" life exists out there but more likely "where" it exists. This book describes the search by radio telescope, the possible evidence of UFOs, the logical process that decrees there *must* be life elsewhere, and, finally, the questions asked about such life by chemists, biologists, astronomers, and philosophers.

Kraus, John. *Big Ear.* Cygnus-Quasar Books. 1976. LC# 76-24396. 228pp. B/w photos. Index. Bibliography. Secondary and adult.

A personal history of radio astronomy by the director-founder of the Ohio State University-Ohio Wesleyan University Radio Telescope. That telescope, the "Big Ear," is his own result of a lifetime involved with radio and astronomy and has become a prime locator of radio sources. The instrument, the size of three football fields, was used for a number of years to search for intelligent signals from extraterrestrials. Simply written for the lay reader, the book contains enough meat for young engineers.

Kuskin, Karla. *A Space Story.* Harper & Row, 1978. LC# 76-24314. Trade ISBN 0-06-023542-1. Library binding ISBN 0-06-23542-X. 32pp. Art by Marc Simont. Primary.

A boy's mother tells him, "people can't live on stars, but I suppose there might be some people out there on planets somewhere." Then he's introduced to the Sun and the planets of our solar system.

Kyselka, Will, and Ray Lanterman. *North Star to Southern Cross.* U. Press of Hawaii, 1976. LC# 75-37655. Hardcover ISBN 0-8248-0411-2. Paperbound ISBN 0-8248-0419-8. 160pp. Two-color art. Index. Upper and up.

A convenient and interesting combination observation book and nontechnical summary of what is known by astronomers today. The vivid illustrations and the readable text evoke the mystery that stars have held and the challenge they've given to science. This is both a manual for quick reference to the night sky and a guide for further study.

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Lambert, David. *The Earth and Space.* Warwick, 1979. LC# 78-68539. Trade ISBN 0-531-09144-0. Library binding ISBN 0-531-09155-9. 93pp. Color photos and art, b/w photos. Index. Glossary. Upper and secondary.

A vividly illustrated guide to the rocks beneath our feet, the space our Earth moves in, and the stars we see. The excellent art clarifies major concepts while dramatic photos highlight the ideas presented. A central chapter shows how we live on our planet, using, and even wasting, the natural materials around us.

Lambright, W. Henry. *Governing Science and Technology.* Public Administration and Democracy series. Oxford, 1976. LC# 75-16905. ISBN 0-19-501981-4. 218pp. Index. Adult.

An exploration of the role played by NASA and other government agencies and departments in science policy decision-making. The author, a university professor, spent a year as a special assistant at NASA and uses NASA as the prime example.

Lampton, Christopher. *Black Holes and Other Secrets of the Universe.* An Impact Book. Watts, 1980. LC# 79-23306. ISBN 0-531-02284-6. 83pp. B/w photos. Index. Bibliography. Upper and secondary.

An extraordinary journey through the stars and galaxies of the universe as well as along the trail the scientists took to discovery of black holes and other phenomena important to understanding where our world has come from and where it is going.

Langseth, Marcus, and Lillian Langseth. *Apollo Moon Rocks.* Coward McCann, 1973. LC# 72-76691. Trade ISBN 0-698-101951-7. Library binding ISBN 0-698-30436-7. 64pp. B/w photos, art by Richard Cuffari. Index. Glossary. Intermediate.

Simple lunar geology, from the first step of an astronaut onto the dusty layer called the regolith. The different types of rock found at different landing sights are explained, along with cratering and dating of materials. Ends with a directory of where lunar samples may be seen.

Lanham, Url. *The Sapphire Planet.* Columbia, 1978. LC# 77-13160. ISBN 0-231-03956-5. 138pp. Index. Secondary and up.

Assumption: our new vision of Earth is a sapphire planet that is an oasis in space. This book describes the physical character of that oasis, its internal structure, conditions of life, development of that life, and our potential for ruining the whole thing.

Lasby, Clarence G. *Project Paperclip: German Scientists and the Cold War.* Atheneum, 1971. LC# 75-108824. ISBN 0-689-70524-7. 338pp. Index. Secondary and adult.

As World War II was closing, a special U.S. intelligence team gathered as many German scientists as possible. This book explores how it was done, the ethical debates that followed, the slow years until 1958 when the German-American rocket team placed a satellite in orbit.

Lay, Bierne, Jr. *Earthbound Astronauts: The Builders of Apollo-Saturn.* Prentice-Hall, 1971. LC# 78-145628. Hardcover ISBN 0-13-222307-4. Paperbound ISBN 0-13-222331-7. 198pp. Secondary and adult.

A readable history of the Saturn V moon rocket, told through the story of its developers and the situation that occurred around it politically, scientifically, and so on. The book presents both the problems and the glories.

Lebedev, Lev, and Alexander Romanov. *Rendezvous in Space: Soyuz Apollo.* Progress Publishers, 1979; dist. by Imported Publications. 209pp. Color and b/w photos. Upper and secondary.

An interesting, minute-by-minute, Soviet account of the first joint Soviet-American space experiment from July 11 through July 25, 1975. Most of the numerous pictures used have not been seen in America. The text is arranged in sections alternating between the authors. Lebedev, a senior researcher at the Institute of Space Exploration, provides the technical explanations of equipment and events. Romanov is a science correspondent for TASS; he provides the "You Are There" type of news coverage.

Lee, Chester M. editor. *Apollo Soyuz Mission Report.* Vol. 34 in the AAS Advances in Astronautical Science Series. AAS, 1977. LC# 57-43769. ISBN 0-87703-089-8. 322pp. B/w photos and diagrams. Glossary. Adult.

A complete, detailed report, from a more technical viewpoint than most, of the ASTP mission, assembled by the Project Director. The performance of all equipment is described, as are the experiments and demonstrations and anomalies in all these. A series of useful appendixes cover the flight timeline, a brief glossary, and an unusual report on special activities to prevent launch delay caused by lightning.

Leinwoll, Stanley. *From Spark to Satellite: A History of Radio Communication.* Scribners, 1979. LC# 78-24172. ISBN 0-684-16048-X. 242pp. B/w photos and diagrams. Index. Secondary and adult.

The steps from the idea for radio to the interplanetary signals now being used have been many and fascinating, and the people involved have been equally so. This readable history explains the technology, the politics, the business, and the future.

Leonov, Alexei. *The Sun's Wind.* Progress Publishers, 1977; dist. by Imported Publications. 54pp. Color art by the author. Intermediate.

An unusual book for young readers by the Soviet cosmonaut who commanded the Apollo-Soyuz Test Project mission for the USSR. He writes about the entire story of the mission, from selection of cosmonauts to their daily activities in space. The cosmonaut's own artwork is used to illustrate this account.

Lerner, Aaron B. *Einstein and Newton, A Comparison of the Two Greatest Scientists.* Lerner, 1973. LC# 72-7653. ISBN 0-8225-0752-8. 236pp. B/w photos. Index. Introduction by Isaac Asimov. Secondary and adult.

A double biography of the two greatest names in physics, in which the author seeks the meaning of genius. Their stories are told as two alternating threads as different aspects of their lives are inspected: exile from academic life, health, fame, religion, and the like.

Levine, Arthur L. *The Future of the U.S. Space Program.* Special Studies series. Praeger, 1975. LC# 73-21468. ISBN 0-275-08700-X. 198pp. Index. Adult.

A professor of "space age" management and administration reviews the history of the U.S. space program and policy-making events and procedures. He then looks at prospects for the future, using the international cooperation of the Apollo-Soyuz mission as a steppingstone.

Levitt, I. M. *Beyond the Known Universe: From Dwarf Stars to Quasars.* Viking, 1974. LC# 73-5232. ISBN 0-670-16107-1. 131pp. Color art by John Gorsuch. Index. Secondary and adult.

In the early 1960s astronomers detected a strong radio force in outer space that was linked to some strange celestial object. Further study revealed a new, exotic, astronomical menagerie—dwarf stars, quasars, black holes, pulsars, neutron stars, supernovas—whose very description presents a scientific challenge. This story of these new "celestial oddballs" presents the current scientific thinking about their behavior.

Lewis, Richard S. *From Vinland to Mars: A Thousand Years of Exploration.* Quadrangle/NY Times, 1978. LC# 76-9716. Hardcover ISBN 0-8129-0647-0. Paperbound ISBN 0-8129-6297-4. 436pp. B/w photos. Index. Secondary and adult.

The author sees the space age as "the modern extension of a process of exploration that began a thousand years ago" . . . a feature of mankind that "may carry future generations to the stars." This detailed book reveals the history of man's role as explorer. The space-related coverage deals primarily with the Apollo program.

________. *The Voyages of Apollo: The Exploration of the Moon.* Quadrangle/NY Times, 1974. LC# 74-77942. ISBN 0-8129-0477-X. 308pp. Secondary and adult.

A full, descriptive narrative of the seven Apollo expeditions to the Moon, six of which landed and explored and one which almost did not return home. The author views these journeys as personal adventures, mass communications events, and evolutionary episodes in our movement out of our earthly cradle. A sequel to the author's earlier book, *Appointment on the Moon.*

Lomask, Milton. *Robert H. Goddard: Space Pioneer.* A Discovery Book. Garrard, 1972. LC# 70-182847. ISBN 0-8116-6308-6. 80pp. Two-color art by Al Fiorentino. Primary and intermediate.

The story of the rocket pioneer's life from his first less-than-successful attempt at flying at age five to his triumphs and disappointments, then death in 1945.

Long, Charles E. *Discovering the Universe.* Harper & Row, 1980. LC# 79-25200. ISBN 0-06-044034-1. 511pp. Color plates, b/w photos and diagrams. Index. Glossary. Adult.

A textbook for the community college, introductory course in a four-year college, or layperson's reading, written with the objectives of having the student acquire the habit of looking regularly at the night sky, understanding what physical theory is, and knowing enough to follow new astronomical discoveries. The relaxed approach is most apparent in the handlettered illustrations. Thought-provoking puzzles appear throughout. The chapters end with exercises (with answers) and reading suggestions.

Longair, M. S., and J. W. Warner, editors. *Scientific Research with the Space Telescope.* NASA CP-2111. US GPO, 1979. Stock no. 3300-00782-5. 340pp. B/w diagrams. Adult.

A compilation of survey papers delivered at a colloquium at Princeton University in August 1979 regarding future research that can be conducted using the Space Telescope. It is expected to be placed in orbit by the Space Shuttle in the mid-1980s.

Lovell, Bernard. *In the Center of Immensities.* Vol. 53 of World Perspectives series. Harper & Row, 1978. LC# 76-26241. ISBN 0-06-012716-3. 190pp. Index. Adult.

A scientist-philosopher looks at current developments in physics and astronomy and explores their implications for our view of ourselves and the universe. Includes the exploration of space, as well as the search for extraterrestrial life, among the facets of the changing view.

________. *Man's Relation to the Universe.* Freeman, 1975. LC# 75-14096. ISBN 0-7167-0356-4. 118pp. B/w photos. Index. Adult.

Based on a series of four lectures given at SUNY at Buffalo in 1973, this is a companion to *The Origins and International Economics of Space Exploration* (see below). It discusses the new concepts developed by observation of Earth and space in recent years and explores our new view of the solar system and the universe beyond through the techniques of spacecraft and radio telescopes.

________. *The Origins and International Economics of Space Exploration.* A Halsted Press Book. Wiley, 1974. LC# 73-18325. ISBN 0-470-54881-7. 140pp. Index. Adult.

The wide issues of space exploration, its origins, economics, and civil and military applications, such as communications, navigation, and earth resources. The book, based on lectures given at the University of Edinburgh in 1973, also includes a history of rocketry.

Lowman, Paul D., Jr. *The Third Planet: Terrestrial Geology in Orbital Photographs.* U. Press of Virginia, 1972. LC# 77-128348. ISBN 0-8139-0577-X. 170pp. Color and b/w photos. Index. Secondary and adult.

A way of studying the forms of the Earth by using the photos from space. The author shows pictures from most manned flights, Nimbus weather satellites, and a Soviet Zond mission. Little technical geological vocabulary is used, making this book useful to a wide audience.

Lowry, Peter, and Field Griffith. *Model Rocketry: Hobby of Tomorrow.* Doubleday, 1972. LC# 74-143815. Trade ISBN 0-385-03076-2. Library binding ISBN 0-385-05236-7. 152pp. B/w photos and diagrams. Index. Glossary. Bibliography. Upper and secondary.

Starting with thoughts on the idiocy of being a "basement bomber," this guide introduces true model rocketry as a safe, fun, and challenging activity. It begins with basic requirements, how to launch, recover, stage, develop payloads, and track. Concluding chapters cover the development of science fair projects and how to start a club. Appendixes include useful trajectory and other tables.

Lucas, John. *The Big Umbrella.* Drake, 1973. LC# 74-25198. ISBN 0-87749-827-X. 160pp. B/w photos. Index. Foreword by Douglas Bader. Secondary and adult.

The unusual subject of parachutes, as pursued by a British journalist, relates the history of the aeronautical "umbrella" from da Vinci, through wars and pleasure jumping, to uses in the space program.

Lunan, Duncan. *Interstellar Contact.* Contemporary Books, 1974. LC# 74-30199. Hardcover ISBN 0-8092-8258-5. Paperbound ISBN 0-553-02204-0 from Bantam, published as *Mysterious Signals from Outer Space.* 324pp. B/w diagrams. Secondary and up.

A two-part, semitechnical book of which the first part was developed from speculative discussions of an Interstellar Project of the Association in Scotland for Technology and Research in Astronautics (ASTRA), concerning the possibility of colonizing space out to a distance of twelve light years. The second part discusses the possibility of contact with alien beings: are we prepared? have we perhaps already been contacted?

________. *New Worlds for Old.* Morrow, 1979. LC# 79-62916. ISBN 0-688-03486-1. 268pp. Color and b/w art and photos. Index. Bibliography. Secondary and adult.

Research and exploration have revealed our solar system to be radically different from anything we imagined only a decade ago. As our knowledge increases, our complacent views about the nature of the planets are being shattered one after the other. What we are discovering is, literally, new worlds for old.

Lundquist, Charles A., editor. *Skylab's Astronomy and Space Sciences.* NASA SP-404. US GPO, 1979. Stock no. 3300-00767-1. 132pp. Color photos and art. Index. Secondary and adult.

"One of the special characteristics of Skylab was its ability to provide a platform for a large number of physically small and relatively simple experiments that could never have obtained a solo ride on a satellite," so says Robert Parker, Skylab Program Scientist, in this beautifully illustrated volume. The subjects investigated are diverse: stellar and galactic astronomy, interplanetary dust, comet Kohoutek, energetic particles, Earth's atmosphere, and orbital environment.

Lye, Keith. *Our Planet The Earth.* A Question and Answer Book. Lerner, 1980. LC# 79-2346. ISBN 0-8225-1182-7. 36pp. Color art. Index. Glossary. Intermediate.

Reveals our planet Earth, as an object in the solar system moving through space, as a habitat, as a subject of interest to space research—all shown in the form of questions that young people ask, answered in brief text and full-page color artwork. The history of our planet is also included.

Lyon, Jene. *Astronomy: Our Sun and Its Neighbors.* Revised edition. A Golden Exploring Book. Golden Press, 1974. ISBN 0-307-61459-X. 48pp. Color art. Intermediate.

This beginning book of astronomy is a revision of *Our Sun and the Worlds Around It.* Its colorful art gives reality to things we don't see easily from Earth—the worlds around our Sun, artificial satellites, other galaxies, along with a look at the effects of the Sun on our own world.

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Macvey, John W. *Interstellar Travel: Past, Present and Future.* Stein & Day, 1977. LC# 77-22353. Hardcover ISBN 0-8128-2278-1. Paperbound ISBN 0-380-41368-X from Avon. 253pp. B/w diagrams. Index. Secondary and adult.

An astronomer explores the ways in which we from Earth, as well as alien beings from elsewhere, may travel between the stars, between galaxies, and even into time. The methods the author proposes are not extensions of current technology but suggestions for "ultrasophisticated techniques that beings several millenia ahead of us might have adopted . . .". The second half of the book reviews possible visitations by aliens.

________. *Whispers from Space.* Macmillan, 1973. LC# 73-5289. 250pp. B/w photos and diagrams. Index. Bibliography. Adult.

Radio astronomy and the search for signals that might emanate from the equipment of intelligent beings. Incorporates a great variety of interestingly told galactic astronomy, plus the problems of establishing communication patterns with an alien race.

Maddox, Brenda. *Beyond Babel: New Directions in Communication.* Simon & Scnuster, 1972. LC# 72-83632. Hardcover ISBN 0-671-21436-5. Paperbound ISBN 8070-6167-0 from Beacon Press. 288pp. Index. Adult.

A fascinating, often humorous, book for the layperson discussing the technology of the new facility for cheap, portable, and instantaneous communication all over the globe. The communications revolution is having and will continue to have impacts beyond our dreams, as the fast-changing technology leads to slower but still evolving social change.

Maffei, Paolo. *Beyond the Moon.* MIT Press, 1978. LC# 77-27091. Hardcover ISBN 0-262-13133-1. Paperbound ISBN 0-380-48744-6 from Avon. 377pp. B/w photos and drawings. Index. Adult.

An Italian astronomer/writer was inspired by the flight of Apollo 11 to look beyond the Moon and explain an imaginery journey through the rest of the universe to the general public. The appendixes describe how distances are determined, how stars are distributed and named, and the discovery of two galaxies by the author.

________. *Monsters in the Sky.* MIT Press, 1977. LC# 79-20041. ISBN 0-262-13153-6. 342pp. Index. Bibliography. Adult.

These monsters are the anomalies of the known universe, puzzling objects or phenomena that don't fit the old rules of astronomy. Because they are often the subject of public controversy, the topics are covered in fuller detail than might otherwise be the case. Some subjects include unusual comets, phantoms of the solar system, various nebulas, X-ray sources, and, of course, black holes.

Magnant, Robert S. *Domestic Satellite Policy: An FCC Giant Step toward Competitive Telecommunications Policy.* Westview, 1977. LC# 76-30840. ISBN 0-89158-226-6. 296pp. B/w diagrams. Bibliography. Adult.

An historical description and analysis of the issues involved in the development of the telecommunications policy of the United States. It relates the history of the Federal Communications Commission and regulation of common carriers and the current involvement of such giants as IBM and AT&T in satellite programs.

Malewicki, Douglas. *Model Rocket Altitude Performance.* Technical Information Report 100. Centuri. 40pp. B/w photos and drawings. Upper and secondary.

An easy way to eliminate mathematical calculations by using graphs to predict peak altitudes that will be reached by most single-stage rockets. Discusses the effects on performance of engine thrust, rocket weight, and aerodynamic drag.

Malone, Robert, and J. C. Suares. *Rocketship: An Incredible Voyage through Science Fiction and Science Fact.* Harper & Row, 1977. LC# 77-261. ISBN 0-06-012851-8. 128pp. B/w photos and art. Bibliography. Secondary and adult.

A history, both real and science fictional, of space travel, with illustration from NASA, comic books, and motion pictures. The science of rocketry is explained as well as the major parts of a space mission. Space clothing, life aboard a spacecraft, and a traveler's guide to the solar system are offered. A concluding chapter on the future shows the imagination of both science fiction writers and scientists planning actual missions.

Mandell, Gordon K., George J. Caporaso, and William P. Bengen. *Topics in Advanced Model Rocketry.* MIT Press, 1973. LC# 72-10386. ISBN 0-262-02096-3. 631pp. B/w diagrams. Adult.

A technical book, photographed from the authors' typewritten manuscript, developed to enhance the participation of older students in the model rocketry hobby, especially engineering students who in the past would probably have dropped rocketry as too simple. Some of the topics included in great depth are flight dynamics, aerodynamic stability, and trajectory analysis.

Manson, Lewis A. *The Birth of the Moon.* Dennis-Landman, 1978. LC# 76-19964. ISBN 0-930422-12-0. 206pp. Color and b/w photos, art by J. Noel. Index. Secondary and adult.

A geologist presents to laypersons the theory that our Moon was born of a cataclysmic collision of Earth with a passing star larger than the Sun. The same event, or similar ones later, damaged other planets, ripped off atmospheres, spun out new satellites, and changed the climate of Earth. To support his closely reasoned argument, he uses numerous dramatic photos and apropos drawings. An appendix lists twenty-three reasons why he thinks the birth of the Moon must be a recent event.

Marder, L. *Time and the Space Traveller.* U. of Pennsylvania, 1974. LC# 77-182498. Hardcover ISBN 0-8122-7650-7. Paperbound ISBN 0-8122-1054-9. 210pp. B/w diagrams. Index. Bibliography. Adult.

The author, in developing an explanation of time dilation, realized that the common example of imagining a spaceship traveling at ninety percent of the speed of light was not sufficient; the example itself needs considerably more explanation. So here is the background to relativity, time paradoxes, experimental evidence for Einstein's theories, and the implications—which may someday be vital to real people—of the problem facing space travellers. A large annotated bibliography concludes the book.

Martin, Elizabeth F., editor. *Aerospace Activities for Learning and Fun.* Prof. E. F. Martin. 40pp. B/w drawings. Primary and intermediate.

A collection of experiments, projects, games, and other activities that present various aviation and space concepts for the elementary classroom. Organized in sections on air, weather, astronomy, and space.

Martin, James. *Communications Satellite Systems.* Prentice-Hall, 1978. LC# 78-5247. ISBN 0-13-153163-8. 398pp. B/w photos, diagrams. Index. Secondary and adult.

For the reader who wants real detail on the history of communications satellites and how they work. This book discusses the implications of worldwide systems as well as the requirements for the ground-based portions of the systems.

Maruyama, Magoroh, and Arthur Harkins, editors. *Cultures Beyond the Earth: The Role of Anthropology in Outer Space.* Random House, 1975. LC# 75-12681. ISBN 0-394-71602-7. 203pp. Foreword by Alvin Toffler. Secondary and adult.

An "extraterrestrial anthropology" book collecting essays from many sources (are some of them science fiction?). Some subjects discussed include moral obligations of the contact with nonhuman cultures, effects of alien contact, political and ethical considerations.

Masursky, Harold, G. W. Colton, and Farouk El-Baz, editors. *Apollo over the Moon: A View from Orbit.* NASA SP-362. US GPO, 1978. Stock no. 3300-00708-6. LC# 77-25922. 255pp. B/w photos, color diagrams. Secondary and adult.

While the astronauts who walked on the Moon's surface got the most public attention, other work went on in the Command Module, especially the detailed photographing of large portions of the lunar surface. A full, semitechnical explanation of the photographic systems used is given. Detailed captions highlight the discoveries made in each photo.

Matson, Wayne R. *The Book of Aerospace Education.* Am. Society for Aerospace Education, 1978. 304pp. B/w photos. Adult.

A collection of articles that appeared in the *Journal of Aerospace Education* from its founding in February 1974 through September 1977. The numerous articles both discuss the philosophy of aerospace education and describe many of the interesting specific programs at the elementary, secondary, and higher levels, as well as the use of aeromodeling techniques.

________. *Educators Guide to Model Rocketry.* Revised edition. Centuri, 1975. 60pp. B/w photos and art. Bibliography. Secondary and adult.

A small "textbook" for the educator that clearly shows the ease with which model rocketry can be introduced into the classroom without advanced knowledge on the part of the instructor. Each chapter ends with a test that reinforces the understanding about rocket parts and procedures.

Matthews, William H., II, compiler. *Helping Children Learn Earth-Space Science.* National Science Teachers, 1971. Stock #471-14606. 250pp. B/w photos and diagrams. Adult.

A collection of 108 articles reprinted from *Science and Children,* divided into five sections: 1) astronomy, 2) geology, 3) meteorology, 4) oceanography and water, and 5) conservation and environment. Many of the articles are concerned with subject matter content; others involve teaching methods and detail suggested student activities to develop understanding of the content.

Mauk Enterprises. *Man in Space Coloring Book.* Mauk Enterprises, 1978. 48pp. B/w art. Primary and intermediate.

This coloring and puzzle book introduces America's manned space program to the crayon-aged children. Each picture is captioned with information. Other text that occurs at intervals as well as data on rockets and various spacecraft are given at a considerably higher reading level. Children can build their own craft by connecting dots. Solution of a final crossword puzzle requires the knowledge built throughout the book.

Maupin, Pauline H. *Aerospace Education: Games and Activities for the Elementary School.* 54pp. B/w drawings. Primary and intermediate.

A spiral-bound collection of games and other simple activities designed to use aerospace as a vehicle for motivation. The pages in the first section may be copied and used as student worksheets in language skills, arithmetic, and geography. The second section is composed of games and activities for which directions are given to the teacher.

Mayall, R. Newton, Margaret Mayall, and Jerome Wyckoff. *The Sky Observer's Guide: A Handbook for Amateur Astronomers.* A Golden Guide. Golden Press, 1977. LC# 65-15201. ISBN 0-307-24009-6. 160pp. Color and b/w photos, color art by John Polgreen. Index. Upper and up.

A handy, pocket-sized, well-illustrated and practical book for the amateur astronomer. It explains simply how to look, when to look, and what to look for. A great deal of general information on the objects in the night sky is packed among the observing instructions.

Maynard, Christopher. *Planet Earth.* Modern Knowledge Library. Warwick, 1976. LC# 76-13526. Trade ISBN 0-531-02444-X. Library binding ISBN 0-531-01197-6. 48pp. Color photos and art. Index. Intermediate.

Our home planet is viewed first as the only one in the solar system with conditions for life. The birth of the Earth, its position and movements in the solar system are described. Remote sensing, which is creating a new type of atlas of Earth, is illustrated. The remainder of the book details the history, principal structures, and atmosphere of the planet we know best.

________. *The Young Scientist Book of Stars and Planets.* EMC Corp., 1978. LC# 78-17545. ISBN 0-88436-528-X. 32pp. Color photos and art. Index. Glossary. Intermediate and upper grades.

A colorful beginner's guide to the universe that shows how scientists explore the sky, what our solar system is like, how to spot stars and other "wonders" in the night sky, and the strange things contemporary astronomy is investigating. Activities for the reader range from simple illustrations of scientific principles to projects such as building a sun projector. The book concludes with sky "firsts" and "facts."

McCall, Robert, and Isaac Asimov. *Our World in Space.* NY Graphic Society, 1974. LC# 73-78567. ISBN 0-8212-0434-3. 176pp. Color art by McCall. Foreword by astronaut Edwin E. Aldrin, Jr. Secondary and adult.

Robert McCall has often been called "the" space artist. In this beautiful volume, his paintings fall into six sections on Apollo and Skylab, Space Shuttle at work, lunar colonization, man on Mars, and the utilization of space. Equally colorful are the words of Isaac Asimov's alternating sections on the Moon, rocketry, lunar colonies, Mars, the asteroids as manned astronomical observatories and steppingstones to the outer planets, and, finally, our quest for the stars.

McDaniels, David K. *The Sun, Our Future Energy Source.* Wiley, 1979. LC# 78-12569. Hardcover ISBN 0-471-18213-9. Paperbound ISBN 0-471-04500-4. 271pp. B/w photos and diagrams. Index. Adult.

A textbook developed from lectures for liberal arts majors taking a minicourse in physics. The discussion is broad-ranging and the technicalities are minimal. Each chapter ends with thought-provoking questions and a bibliography.

McGowan, Tom. *Album of Astronomy.* Rand McNally, 1979. LC# 79-9485. Trade ISBN 0-528-82048-6. Library binding ISBN 0-528-80048-5. 64pp. Color and b/w art by Rod Ruth. Index. Intermediate.

A young reader's colorful guide to the universe, with emphasis on our solar system. Stars are covered only briefly; however, the end papers are star charts. A pronunication guide is given at the end.

Meador, Roy. *Future Energy Alternatives.* Ann Arbor Science, 1978. LC# 77-92590. Hardcover ISBN 0-250-40202-5. Paperbound ISBN 0-250-40221-1. 198pp. B/w photos and diagrams. Index. Secondary and adult.

This readable book is an assessment of our rapidly dwindling fossil fuels and a realistic appraisal of the alternatives—fusion, fission, solar, coal, hydrogen, geothermal, tidal, and hydropower. For each of these, their availability, technology, practicality, and economics are discussed in nontechnical terms.

Mehlin, Theodore G. *Astronomy and the Origin of the Earth.* Third edition. Foundations of Earth Science series. William C. Brown, 1979. ISBN 0-697-05018-1. 136pp. B/w photos and diagrams. Index. Adult.

A short, introductory level book places Earth within the universe. It begins at the surface of our planet and moves outward, describing what we know and how we know it, about the atmosphere, Moon, solar system, Sun, stars, and galaxies. Useful on its own or as supplementary reading.

Merleau-Ponty, Jacques, and Bruno Morando. *The Rebirth of Cosmology.* Knopf, 1976. LC# 74-21319. ISBN 0-394-48267-0. 301pp. B/w diagrams. Index. Adult.

In an unusual collaboration, an astronomer and a philosopher look at the three main cosmologies of Western man: the geocentric view of the ancient world; the classical revolution of Copernicus, Kepler, and Newton; and, finally, the less limited modern cosmology that developed after Einstein. The philosopher and the scientist alternate their essays, the former looking at the implications of the science, and the latter detailing what was "known," often in quite technical fashion.

Metos, Thomas H., and Gary G. Bitter. *Exploring with Solar Energy.* Messner, 1978. LC# 78-15179. ISBN 0-671-32948-0. 64pp. B/w photos and diagrams. Index. Intermediate.

The ancient Indians of the Southwest heated and cooled their buildings by the natural processes of Sun and wind. This book describes the evolution of the idea into modern times. It includes a section of experiments both for understanding and utilizing solar energy.

Miles, Howard, editor. *Artificial Satellite Observing and Its Applications.* Elsevier, 1974. LC# 73-17949. ISBN 0-444-19544-0. 216pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

Though satellite tracking is generally the business of a worldwide network of professionals, amateur astronomers can derive a great deal of pleasure in learning to interpret the type of object being seen in the sky from the direction of travel and its light characteristics. This book relates the history of artificial satellites, describes how they are placed in orbit, and shows how to predict their appearance.

Miller, George. *Life in the Universe: An Introduction to the Search for Extraterrestrial Intelligence.* Harvard-Smithsonian Center for Astrophysics. 15pp. B/w photos on paper cover. Secondary and adult.

A brief exploration for the lay reader of the questions asked about the possibility of intelligent life elsewhere in the universe, the ways we are trying to communicate or read their signals, as well as proposals for future activities.

Miller, Ron, compiler. *Space Art.* A Starlog Photo Guidebook. Starlog, 1978. Hardcover ISBN 0-931064-06-6. Paperbound ISBN 0-931064-04-X. 192pp. Color and b/w art. Index of artists. Intermediate and up.

The artists has played a major role in our fantasies of space travel since science fiction began. The fine space artist is one whose art is based on complete accuracy of astronomical detail. This collection of space art shows work by the masters, views of the planets, and details of the technology and hardware. Introductory material provides a history of space art.

________. *The Space Art Poster Book.* Stackpole, 1978. ISBN 0-8117-2077-2. 48pp. Color art. Intermediate and up.

This 11 × 16-inch paperbound book encloses twenty-three full-color posters inspired by the new era of space exploration—the surface of Mars, a close-up of Saturn's rings, cities in space.

Misenhimer, Ted G. *Aeroscience.* Third edition. Aero Products, 1976. LC# 76-21979. ISBN 0-912682-13-2. 798pp. Color and b/w photos, diagrams. Index. Glossary. Secondary and adult.

The subject of aerospace is given comprehensive coverage from the time of the ancient Chinese rockets of fire to the current U.S. rockets. Some of the subjects include basic aeronautics, meteorology, navigation, rules of flight, high-speed aerodynamics, physiology of flight, humans in space, history of aviation, and career opportunities. Thoughtful questions are asked at the end of each chapter. A sectional chart and sample private pilot exam are included.

Mitchell, Charles W., and Joseph E. Riley. *Beginning Model Rocketry.* McClain, 1971. LC# 71-183622. ISBN 0-87012-116-2. 40pp. B/w photos and diagrams. Upper and up.

A paperbound guide for teachers interested in starting a model rocket program. It details materials, procedures, launching, sources, and safety hints. A collection of suggested rocketry activities ties into a number of different curricular areas. The photographs show young people fully involved in model rocketry.

Mitroff, Ian I. *The Subjective Side of Science: A Philosophical Inquiry into the Psychology of the Apollo Moon Scientists.* Elsevier, 1974. LC# 74-77584. ISBN 0-444-41233-6. 329pp. Index. Adult.

The subjects of this study were forty Apollo scientists interviewed four times over three years. It explores the nature of science and of scientific work, and, "Above all, this book is an essay about how scientists often have exceedingly good reasons for behaving irrationally." It looks exactly at how scientists behave instead of at the logical way they are usually said to behave.

Mitton, Jacqueline. *Astronomy: An Introduction for the Amateur Astronomer.* Scribners, 1978. LC# 78-13383. ISBN 0-684-16042-0. 142pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

This nontechnical guide for the layperson provides an emphasis on the science behind astronomy and on current astronomical knowledge rather than on the practical aspects of amateur astronomy. It begins with the usual first subject of the amateur, the Moon, then deals with the planets and our own motions in space. The second part of the book moves outward into the stars and speculates on the nature of the universe.

Mitton, Jacqueline and Simon. *The Prentice-Hall Concise Book of Astronomy.* Prentice-Hall, 1978. LC# 78-9695. ISBN 0-13-166967-2. 96pp. Color and b/w photos and diagrams. Index. Upper and up.

An attractive and quite comprehensive illustrated guide to the universe and the fascinating world of astronomy. Each two-page spread deals with one concept, such as day and night, a solar eclipse, astronomy in space, the Martian surface, double stars, or quasars. The well-chosen photographs and artwork can stand alone with their captions or be used to augment the straightforward text.

Mitton, Simon. *Exploring the Galaxies.* Scribners, 1977. LC# 76-42913 Hardcover ISBN 0-684-14862-5. Paperbound ISBN 0-684-15579-6. 206pp. B/w photos and diagrams. Index. Adult.

Scientists can now probe farther into the depths of the universe than ever before, and what they are learning about the huge star systems called galaxies is revolutionizing our thinking about the universe. Although somewhat technical in parts, the explanations are clear and the conclusions drawn are fully comprehensible to laypersons.

Mitton, Simon, editor. *The Cambridge Encyclopedia of Astronomy.* Crown, 1977. LC# 77-2766. ISBN 0-517-52806-1. 495pp. Color and b/w photos and art. Index. Secondary and adult.

The word "encyclopedia" is here a misnomer. This book is more a colorful introductory guide, without an alphabetical arrangement. Among the subjects covered are birth and death of stars, distant galaxies, our solar system, the history of astronomy, and astronomy in space.

Moché, Dinah L. *The Astronauts.* Random House, 1978. LC# 78-54955. Trade ISBN 0-394-83901-3. Library binding ISBN 0-394-93901-8. Paperbound ISBN 0-394-83900-5. 32pp. Color photos. Primary.

More full-color photos than text, this simple book tells how men have traveled to the Moon, explored it, and worked on Skylab, the first space station. Artwork is used to anticipate flight aboard the Space Shuttle.

_______. *Astronomy: A Self-Teaching Guide.* Wiley, 1978. LC# 77-27367. ISBN 0-471-01764-7. 282pp. B/w photos and diagrams, plus star charts. Index. Secondary and adult.

An efficient, programmed, paperbound text for use by the layperson, this guide introduces some of contemporary science's most fascinating questions about humanity and the universe. Simple experiments use common materials. Each chapter is divided into short sections, called frames, that introduce new information and ask the reader to do something; it then concludes with a self-test.

_______. *Life in Space.* A Ridge Press Book. A & W Visual Library, 1979. LC# 79-51841. Hardcover ISBN 0-89104-154-9. Paperbound ISBN 0-89104-155-9. 160pp. Color and b/w photos. Index. Upper and up.

A collection of incredible pictures of outer space, including NASA photos of the Moon landings and Soviet photos of Venus. The pictures are used as the starting points for straightforward discussions of life, our solar system, the search for other planetary systems, space travel, SETI, space colonies, and UFOs.

_______. *Mars.* An Easy-Read Fact Book. Watts, 1978. LC# 78-2762. ISBN 0-531-01374-X. 48pp. Color photos and art. Index. Primary.

A simple, descriptive book about the Red Planet, based on the Viking landings and the discoveries they made. The full-color photos make the planet appear to be a place well worth exploring further.

_______. *Search for Life beyond Earth.* An Impact Book. Watts, 1978. LC# 78-6273. ISBN 0-531-02204-8. 86pp. B/w photos and art. Index. Bibliography. Upper and secondary.

A brief introduction to the idea of worlds beyond ours: what we know is in the universe, how life evolved, the space program's look beyond our Earth, space travel as it is possible, and the search for extraterrestrial intelligence.

_______. *The Star Wars Question and Answer Book about Space.* Random House, 1979. LC# 78-19684. Trade ISBN 0-394-84053-4. Library binding ISBN 0-394-94053-9. Paperbound ISBN 0-590-30065-2 from Scholastic. 61pp. Color photos and art by David Kawami. Intermediate.

Using the popular figures of robots R2D2 and C3PO as guides, this book carries young readers through the universe, starting with the critical question: Is there intelligent life in outer space? Other topics illustrated and briefly discussed are the Sun, Moon, Mars, robots, asteroids, galaxies and galactic cruises for human travel, space stations, and the Space Shuttle.

_______. *What's Up There? Questions and Answers about Stars and Space.* Scholastic, 1976. ISBN 0-590-04850-3. 64pp. B/w photos, art by Tom Huffman. Intermediate.

A small paper-covered introduction, arranged by questions, to the stars in the night sky, our Sun, the solar system, the Moon, the Milky Way. The book ends with suggestions for learning more and questions that don't yet have answers.

Moncure, Jane Belk. *Skip Aboard a Space Ship.* Creative Dramatics series. Child's World, 1978. LC# 77-12958. Hardcover ISBN 0-89565-009-6. Paperbound ISBN 0-89565-042-8. 32pp. Color art by Helen Endres. Primary and intermediate.

Two boys sleeping out in a treehouse imagine that they are astronauts going to the Moon. One of a series of stories just for reading or for leading young children to act out an idea.

Moore, Patrick. *Can You Speak Venusian? A Guide to the Independent Thinkers.* Norton, 1972. LC# 73-8846. ISBN 0-393-06394-1. 174pp. B/w diagrams. Index. Secondary and adult.

An unusual book that explores the world of independent thought—the people, often highly qualified scientists, sometimes intuitive laypersons, who have gone against the mainstream of scientific thought. Sometimes they have been spectacularly wrong; sometimes they seem almost to be right. Among the ideas of the independent thinkers dealt with are the flat Earth, cold Sun, Velikovsky's comet that became Venus, a universe made of ice, and even an edible spaceship.

_______. *Comets: An Illustrated Introduction.* Revised edition. Scribners, 1976. LC# 76-24937. Hardcover ISBN 0-684-14749-1. Paperbound ISBN 0-684-15581-8. 160pp. B/w photos and drawings. Index. Glossary. Secondary and adult.

Comets are creatures of our solar system, "the nearest approach to nothing that can still be anything." Their importance comes, perhaps, mainly from human reaction to their appearance in the night sky. This volume describes simply what they are and how famous ones have been studied. The question of how they originate relates to the origin of the solar system itself.

________. *Guide to Mars.* Norton, 1977. LC# 77-11088. ISBN 0-393-06432-8. 214pp. B/w photos and drawings. Secondary and adult.

Traces the knowledge of Mars through history and brings it up to date with the discoveries made by Vikings 1 and 2. The author explores what happened to the "canals," the changing polar cap, and our neighbors, the Martians, in light of space-probe photography and the search for signs of life. He concludes with a discussion of mysteries yet to be solved and a projection of future exploration of the planet.

________. *New Guide to the Moon.* Norton, 1976. LC# 76-47333. ISBN 0-393-06414-X. 320pp. Index. Secondary and up.

"The Eagle has landed" and our knowledge about the brightest object in the night sky has expanded greatly, but many speculations remain. This lively description of our satellite, its geography, geology, and movements, is for readers who want to travel there by telescope, spacecraft, or imagination. A major section of appendixes discusses lunar observation and provides a detailed map of the four quadrants.

________. *The New Guide to the Stars.* Norton, 1974. LC# 75-20381. ISBN 0-393-06406-9. 251pp. B/w photos and diagrams. Index. Secondary and adult.

Not so much a guide to observing the stars as an introduction for understanding them, with all the basics needed for a solid background and all the excitement of recent discoveries of quasars, pulsars, black holes. The history of astronomy is fully integrated into the facts discussed.

________. *The Next Fifty Years in Space.* Taplinger, 1976. LC# 75-26326. Hardcover ISBN 0-8008-5528-0. Paperbound ISBN 0-8008-5529-9. 144pp. Color and b/w photos and art. Index. Secondary and adult.

This astronomer/writer has little doubt that the progress to be made during the next five decades will dwarf all that has gone before. In a nontechnical, often humorous style, Moore describes the prospects ahead in space as almost unlimited. By A.D. 2000, we will not have reached the stars, but we will continue to explore the outer reaches of the solar system. There may be advanced bases on the Moon, and certainly there will be orbital stations, some with permanent crews.

Moore, Patrick, and Charles A. Cross. *Mars.* Crown, 1973. LC# 73-78847. ISBN 0-517-50527-4. 48pp. Color and b/w photos and art. Secondary and adult.

Called by the authors "the first authentic guide to another world," this guidebook uses the photos of Mariners 4,6,7, and, primarily, 9 to create an atlas of Mars. Major features are shown, along with volcanoes, craters, rift valleys. Mankind's historical view of the planet as well as exploration techniques are discussed.

Moore, Patrick, and David Hardy. *The New Challenge of the Stars.* Rand McNally, 1978. LC# 71-18909. ISBN 0-528-83087. 64pp. Color art by David Hardy. B/w photos. Foreword by Arthur C. Clarke. Intermediate and up.

Using the artwork, both realistic and fantastic, of David Hardy as a starting point, Moore presents "a science fact look at science fiction." The real Skylab leads to a space city; a manned landing on Mars opens the gates to the entire solar system. All the fascination of the unknown is here, on a sturdy base of the knowns and the possible of our universe.

Moore, Patrick and Iain Nicolson. *Black Holes in Space.* Norton, 1974. LC# 75-15604. ISBN 0-393-06405-0. 126pp. B/w diagrams. Index. Upper and Secondary.

Black holes seem the stuff of science fiction, yet, as these authors observe, "science fiction has a habit of turning inexorably into science fact." In this lucid account of the proposal for the existence of black holes and the continuing search for proof of their reality, readers gain a clear understanding of the evolution of stars as well as the revolution in astronomical thought.

Morgenthaler, George W., editor. *Space Shuttle and Spacelab Utilization: Near-term and Long-term Benefits for Mankind.* Vol. 37, Parts I and II, in the AAS Advances in the Astronautical Sciences series. AAS, 1978. LC# 57-43769. Part I ISBN 0-87703-096-0. Part II ISBN 0-87703-097-9. 855pp. total. B/w photos and diagrams. Adult.

The proceedings of the Twenty-fourth AAS Annual Meeting and the Sixteenth Goodard Memorial Symposium held in 1978 in Washington, D.C. A sometimes technical, sometimes philosophical look at the Space Shuttle and its important Spacelab activities. Their potential for impact on science, Earth resources, and industrialization of space is discussed as is their role as a steppingstone to the future.

Morgenthaler, George W., and William J. Bursnall, editors. *Space Shuttle Payloads.* Vol. 30 in the AAS Science and Technology series. AAS, 1973. ISBN 0-87703-063-4. 517pp. B/w photos and diagrams. Adult.

Proceedings of a symposium held at the 1972 annual meeting of the American Association for the Advancement of Science in Washington, D.C., looking at the potential of the Space Shuttle from the viewpoint of the users: scientists, industrialists, public officials, and their international counterparts. The topics of the eight sessions were: 1) Shuttle capabilities, 2) science payloads, 3) applications payloads, 4) technology and engineering development payloads, 5) cost-effectiveness studies, 6) space operations roles for the Shuttle, 7) international participation, and 8) a panel discussion on the Shuttle's contributions to national goals.

Morgenthaler, George W., and Howard D. Greyber, editors. *Astronomy from a Space Platform.* Vol. 28 in the AAS Science and Technology series. AAS, 1972. LC# 73-159623. ISBN 0-87703-061-8. 398pp. B/w photos and diagrams. Adult.

A collection of nontechnical papers presented at an unusual symposium held in 1971 specifically to interest the public (and other scientists) in the values of astronomical research in general and as it pertains to the space program specifically. The program was divided into five parts: planetary and solar astronomy; stellar and galactic astronomy; new astronomy areas and very large space telescopes; advanced applications; and a panel on strategies for space-based astronomy.

Morgenthaler, George W., and Gerald E. Simonson, editors. *Skylab Science Experiments.* Vol. 38 in the AAS Science and Technology series. AAS, 1975. ISBN 0-87703-074-X. 257pp. B/w photos and diagrams. Adult.

Proceedings of a symposium at the 140th Annual Meeting of the American Association for the Advancement of Science in San Francisco in 1974. It dealt with the results of the recently completed Skylab missions and involved physical science, space-based applications, life sciences, and earth applications.

Morris, Richard. *The End of the World.* Anchor Press/Doubleday, 1980. LC# 79-8437. ISBN 0-385-15523-9. 180pp. B/w photos. Index. Bibliography. Adult.

A doomsday look at the natural disasters that could destroy man—biology, atmospheric change—and then the greater astronomical events that could destroy Earth. Finally, the universe itself is seen potentially to have an ending, perhaps as a black hole.

Morrison, David, and Jane Samz. *Voyage to Jupiter.* NASA SP-439. US GPO, 1980. Stock no. 3300-00797-3. LC# 80-600126. 199pp. Color and b/w photos. Bibliography. Secondary and adult.

A thoroughly illustrated report, in detailed but not overly technical fashion, of the mission to Jupiter, the photos returned to Earth, and the discoveries made about the largest planet in our solar system. The background of the earlier Pioneer missions is also presented.

Morrison, Philip, John Billingham, and John Wolfe, editors. *The Search for Extraterrestrial Intelligence (SETI).* NASA SP-419. US GPO, 1977. Stock no. 3300-00696-0. Also available from Dover ISBN 0-486-23890-3. 292pp. B/w photos. Bibliography. Foreword by Dr. Theodore M. Hesburgh. Adult.

A summary of the findings of a group of sixteen U.S. scientists on ways to detect possible radio signals from intelligent beings in the universe. The volume is based on the results of a series of SETI workshops held during 1975 and 1976. It consists of three major sections: Consensus, which expands on the conclusions reached by the participants; Colloquies, which discusses evolution, search plans, and other subjects central to SETI; and Complementary Documents, papers on a variety of related subjects.

Motz, Lloyd. *On the Path of Venus: Pioneers of the Solar System.* Pantheon, 1976. LC# 75-45415. Trade ISBN 0-394-83106-3. Library binding ISBN 0-394-93106-8. 206pp. B/w art by Susan Detrich. Upper and secondary.

An account of the growth of astronomical knowledge, especially pertaining to our solar system, told through brief biographies of the major figures involved: Aristarchus, Ptolemy, Copernicus, Tycho Brahe, Kepler, and others. The framework for the stories is provided by the young son of an astrophysicist who seeks answers from his father.

________. *The Universe: Its Beginning and End.* Scribners, 1976. LC# 75-6635. ISBN 0-684-14239-2. 346pp. B/w photos and diagrams. Index. Bibliography. Secondary and adult.

The origin, evolution, and ultimate collapse of the universe, as well as all existing structures in it, are seen to be the result of the four known forces of nature: gravity, electromagnetism, nuclear force, and weak interaction force. The vast motions of matter in the universe and the synthesis of the molecules of life, both part of the same pattern, are described for the general reader.

Motz, Lloyd, editor. *Rediscovery of the Earth.* Van Nostrand. 1980. LC# 79-24650. ISBN 0-442-26779-7. 279pp. Color and b/w photos and art. Index. Adult.

This thoroughly illustrated guide to the new knowledge about our constantly changing Earth is of Italian origin, translated and revised by American and Commonwealth scientists involved in the subjects under discussion. It begins in space, goes back to the formation of our world, explores plate tectonics, and follows environmental changes through 4.5 billion years. The four-color maps and diagrams throughout clarify complicated concepts and explain what is seen in the photographs.

Murdin, Paul and Lesley. *The New Astronomy.* Crowell, 1978. LC# 77-5788. ISBN 0-690-01474-0. 215pp. B/w photos and diagrams. Index. Upper and secondary.

In the last twenty years, astronomy has been revolutionized just as surely as it was in the sixteenth and seventeenth centuries, this time by the discoveries made by nonoptical means. Black holes, white dwarfs, pulsars, quasars, and supernovas—these are the stuff of the new astronomy. The Australian authors use the fascinating Crab Nebula as the centerpiece in their nontechnical book.

Murdin, Paul, and David Allen. *Catalogue of the Universe.* Crown, 1979. LC# 79-492. ISBN 0-517-53616-1. 256pp. Color and b/w photos, diagrams. Index. Glossary. Adult.

Bringing the cataloguing of astronomical features to the layperson, this guide to the heavens shows in photos accumulated from all over the world, plus many taken just for this book by David Malin, the most interesting and unusual features. The major topics are galaxies, stars and nebulas, and the solar system. The photos are fully explained, opening the book to younger readers.

Murphy, Robert E. *Teacher's Guide for NF-58 Comparing the Planets,* see U.S. NASA. *Comparing the Planets.*

Murray, Bruce C. *Navigating the Future.* Harper & Row, 1975. LC# 74-1839. ISBN 0-06-013122-5. 172pp. Bibliography. Secondary and adult.

The director of Cal Tech's NASA Jet Propulsion Laboratory provides an optimistic view of the odds on mankind's survival, challenging both the doomsday view and those who say we'll just move out into space. The volume develops from discussions with a population expert, biologist, chemist, physicist, sociologist, historian, politician, theologian, and federal judge.

Murray, Bruce C., and Eric Burgess. *Flight to Mercury.* Columbia, 1977. LC# 76-25017. ISBN 0-231-03996-4. 162pp. B/w photos. Index. Secondary and adult.

This book provides a personal account of the how and why of mankind's first look at the innermost planet and how it felt to be involved. The diary-like text describes the launch of Mariner 10 in November 1973, the use of Venus' gravitational pull to send Mariner on to Mercury, and the three trips the probe made until March 1975 when the attitude control gas finally ran out. The space details are mixed in with events occurring on Earth at the same time.

Mutch, Thomas A., et al. *The Geology of Mars.* Princeton, 1976. LC# 75-30199. ISBN 0-691-08173-5. 400pp. Color and b/w photos, diagrams. Index. Bibliography. Adult.

A geological atlas of our neighboring planet, created from more than 400 photos taken by Mariner 9, the spacecraft that spent most of one year in orbit around Mars taking photographs. Though sometimes technical in detail, this book conveys the excitement of discovery, the puzzles to be answered, the implication for our understanding of the entire solar system. Appendixes deal with data collection and interpretation.

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Narlikar, Jayant. *The Structure of the Universe.* Oxford, 1976. LC# 77-358783. Hardcover ISBN 0-19-217653-6. Paperbound ISBN 0-19-289082-4. 272pp. B/w photos and drawings. Index. Glossary. Bibliography. Adult.

In this book for the curious, nontechnical layperson, the author looks at the universe and Earth from two points of view: the application of earthly physical principles to the structure of the universe, and the reciprocal application of what is known about the universe to understanding the Earth. Black holes, neutrinos, quasars, galactic radio sources—all have relevance to us.

National Research Council. *Practical Applications of Space Systems.* National Academy of Sciences, 1975. 73pp. Adult.

The abbreviated report of a summer study conducted by the National Academy of Engineering at the request of NASA into future applications of space systems, with particular emphasis on practical approaches, taking into consideration socioeconomic benefits. It summarizes the findings on ways to put space capability to work in such areas as weather, land-use planning, water resources, and materials processing. In addition, it looks at the need for organizing people and institutions to use the new capability as well as benefits and costs.

Navarra, John Gabriel. *Superplanes.* A Chicago Museum of Science and Industry Book. Doubleday, 1979. LC# 77-16936. Trade ISBN 0-385-12561-5. Library binding ISBN 0-385-12562-3. B/w photos. Index. Upper.

These are the planes specially adapted for specific purposes, such as Navy planes that fly through hurricanes, NASA's Learjet Observatories with telescopes built into their sides, planes adapted for aerial survey photography, and even short-takeoff-and-landing craft that can maneuver in very tight spots. The book ends with a prediction of what future air travel will be like.

Newell, Homer E. *Beyond the Atmosphere: Early Years in Space Science.* NASA History Series SP-4211. US GPO, 1980. Stock no. 3300-00798-1. LC# 80-607146. 520pp. B/w photos and art. Index. Glossary. Bibliographic Essay and Source Notes. Adult.

Head of the space science program and Associate Administrator for the first fifteen years of NASA history, the author describes "those scientific investigations made possible or significantly aided by rockets, satellites, and space probes." He details an insider's view of the early harvest of science from using V-2-based rocketry, the politics and decision-making of early years, the growing internationalism of space, and the discoveries made beyond the atmosphere. He concludes by discussing the recent—and probably future—questioning and redefinition of NASA's role.

Newkirk, Roland W., and Ivan D. Ertel, with Courtney G. Brooks. *Skylab: A Chronology.* NASA History Series SP-4011. US GPO, 1977. Stock no. 3300-00677-2. 480pp. B/w photos and diagrams. Index. Secondary and adult.

Starting with Hermann Oberth's 1923 proposal for a manned space station, this comprehensive, nontechnical history details the development of the space station idea until official acceptance. The major portion of the book then relates, almost day by day, the activities of the Apollo Applications Program which, in 1970, was redesignated Skylab. Each diary-like entry is followed by sources information.

Nicolson, Iain. *The Road to the Stars.* Morrow, 1978. LC# 78-52473. Hardcover ISBN 0-688-03336-9. Paperbound ISBN 0-451-61780-0 from New American Library. 224pp. Color and b/w photos and art. Index. Secondary and adult.

"There is a whole Universe to explore." And with the passing of Pioneer 10 out into distant space, "the first journeys into the interstellar void" have already begun. Interstellar travel for humanity is examined as a technically feasible possibility for the next century.

________. *Simple Astronomy.* Scribners, 1973. LC# 73-11573. ISBN 0-684-13640-6. 64pp. Two-color art by Don Pottinger. Index. Secondary and adult.

Introductory, nontechnical astronomy on a considerably broader plain than just locating stars in constellations. It begins with why our sky changes and describes how the universe is measured and the instruments used in astronomy. Then a more detailed review, with many useful drawings, is given to the solar system, stars, and galaxies.

Nininger, Harvey H. *Find a Falling Star.* Eriksson, 1972. LC# 72-83710. Hardcover ISBN 0-8397-2229-X. Paperbound ISBN 0-8397-2230-3 from American Meteorite Laboratory. 288pp. B/w photos. Index. Glossary. Introduction by Fred L. Whipple. Secondary and adult.

Whipple says, "Meteorites are truly more precious than diamonds, because they carry cryptic messages of happenings somewhere in the solar system more than four billion years ago." This autobiography is the story of one man who spent a lifetime studying those "cryptic messages," starting long before the subject was regarded as anything more than a frivolous sideline.

Nixon, William D., and Richard E. McCormack. *Landsat: A Tool for Your Classroom.* US GPO, 1978. Stock no. 3300-00746-9. 16pp. Color photos. Adult.

A NASA reprint of an article from *Social Education,* official journal of the National Council for the Social Studies. The article introduces the social and environmental uses of remote sensing imagery. Classroom activities are suggested as are sources of teacher materials.

Norby, M. O. *Soviet Aerospace Handbook.* Air Force Pamphlet 200-21. US GPO, 1978. Stock no. 008-070-00402-0. 223pp. B/w photos. Bibliography. Secondary and adult.

This paperback was published by the Air Force to promote public awareness of the air and space capabilities of the Soviet Union. It describes the USSR's aerospace forces, its doctrine both historically and currently, its military resources, and life in the Soviet Air Force. Both its missiles and space program are described. The book concludes with brief biographies of some of the major figures in Soviet aerospace.

Nourse, Alan E. *Asteroids.* A First Book. Watts, 1975. LC# 74-12020. ISBN 0-531-00822-3. 59pp. B/w photos and drawings. Index. Intermediate and upper.

To understand asteroids, the collections of tiny planets in orbit generally between Mars and Jupiter, one must understand the structure and motion of our whole solar system. This book describes how asteroids were discovered, the early thinking that went into the Bode-Titius law, how asteroids move, and how they might be explored and even utilized by man.

________. *The Giant Planets.* A First Book. Watts, 1974. LC# 73-14515. ISBN 0-531-00816-9. 62pp. B/w photos and drawings. Index. Intermediate and upper.

The outer planets are very different from Earth's immediate neighbors, seemingly a totally different family of planets. This book describes what was known about Jupiter, Saturn, Uranus, and Neptune before the Pioneer and Voyager flights. Pluto is a mystery, little is known except how it was discovered.

NSF/NASA Solar Energy Panel. *An Assessment of Solar Energy as a National Energy Resource.* US GPO, 1972. Stock no. 3800-00164. 85pp. B/w diagrams. Adult.

The findings of a science and engineering panel convened when it became clear that the U.S. faced a severe energy problem. The state of solar energy technology and its potential applications are investigated.

O

Oliver, Carl R., compiler. *Plane Talk: Aviators' and Astronauts' Own Stories.* Houghton Mifflin, 1980. LC# 80-16052. ISBN 0-395-29743-5. 179pp. B/w photos. Bibliography. Upper and up.

Famous pilots talk about their famous flights, providing a first-hand account of the history of aviation. Among the nineteen excerpts included are ones by Orville Wright, Eddie Rickenbacker, Slats Rodgers on flying circus acts, Amelia Earhart, Curtis LeMay, Alan Shepard, Joseph Walker on flying above the atmosphere, Gus Grissom, Michael Collins, and Buzz Aldrin.

Olney, Ross R. *Out to Launch: Model Rockets.* Lothrop, 1979. 79-12402. Trade ISBN 0-688-41918-6. Library binding ISBN 0-688-51918-0. 126pp. B/w photos. Index. Bibliography. Intermediate and upper.

An introduction for all ages to the hobby and sport of model rocketry. Photographs thoroughly illustrate the stages, from construction, launching and tracking, to recovery. Experimenting with various types of payloads is also included.

________. *They Said It Couldn't Be Done.* Dutton, 1979. LC# 78-12405. ISBN 0-525-41060-0. 123pp. B/w photos. Index. Bibliography. Intermediate.

A collection of short, illustrated articles on difficult feats of American engineering, including the Brooklyn Bridge, Mount Rushmore, Gateway Arch in St. Louis, the Astrodome, and, finally, the longest chapter in this interesting book, the Moon landings of the Apollo program.

O'Neill, Gerard K. *The High Frontier: Human Colonies in Space.* Morrow, 1977. LC# 76-27860. Hardcover ISBN 0-688-03133-1. Paperbound ISBN 0-533-11016-0 from Bantam. 288pp. B/w photos and art. Index. Adult.

The current interest in space colonization stems from this physicist-author's 1969 proposal for space colonies and a subsequent NASA summer workshop program (see Johnson: *Space Settlements*). This volume is O'Neill's own contribution to the growing literature, going into considerable detail on his and others' ideas for high-orbital manufacturing and living facilities.

Ordway, Frederick I., III. *Pictorial Guide to Planet Earth.* Crowell, 1975. LC# 74-34291. Hardcover ISBN 0-690-62193-0. Paperbound ISBN 0-690-01675-1. 191pp. Color and b/w photos. Index. Bibliography. Secondary and adult.

Perhaps the main benefit of the space program so far is the view it has given us of our own Earth. All the pictures in this unusual photo album of Earth were taken from above, either by airborne cameras or from orbit, and provide a fascinating geography and geology, twentieth-century style. Inland waters, snow cover, agriculture, forestry, the oceans, and the atmosphere are among the subjects covered.

Ordway, Frederick I., III, Carsbie C. Adams, and Mitchell R. Sharpe. *Dividends from Space.* Crowell, 1971. LC# 70-170997. ISBN 0-690-24134-8. 309pp. B/w photos. Index. Introduction by Wernher von Braun and S. Fred Singer. Secondary and adult.

Interesting and readable coverage of benefits from space to home and industry, health, earthly environmental problems, communications and industrial research, by authors who have been involved since the beginnings of the space program.

Ordway, Frederick I., III, and Mitchell R. Sharpe. *The Rocket Team.* Crowell, 1979. LC# 78-3313. ISBN 0-690-01656-5. 462pp. B/w photos. Index. Bibliography. Foreword by Wernher von Braun. Secondary and adult.

The "Rocket Team" was that historical group of German scientists and engineers who, under the leadership of Wernher von Braun, developed the science of rocketry from the early 1930s through the ultimate development of the Saturn project that placed men on the Moon. Completely researched and documented, this work presents much previously classified material and accurately portrays the development and role of the V-1 and V-2 rockets during World War II and the subsequent peacetime development of the American space program.

Oriti, Ronald A., and William B. Starbird. *Introduction to Astronomy.* Glencoe Press, 1977. LC# 76-4050. ISBN 0-02-478560-1. 424pp. Color and b/w photos, diagrams. Index. Glossary. Adult.

An introductory textbook for the nonscience student consisting of three major parts: astronomical history, the solar system, and stellar astronomy. Generous use of illustrations, many from NASA programs, reinforces the text. Each chapter ends with a series of questions. An unusual special fourth section, called "Special Sidelights" includes mythology, astrology, extraterrestrial life, and the value of space exploration.

Ottewell, Guy. *The Astronomical Companion.* Furman, 1979. ISBN 0-934546-01-0. 72pp. B/w illustrations by the author. Bibliography. Secondary and adult.

Developed from the accumulating nondated material that appeared in *Astronomical Calendar* (see Reference: Annuals), this volume uses the same large hand-drawn format; however, it can easily stand alone as interesting background reading material on night-sky observing. Among the subjects discussed and illustrated are position in space, constellations with a large glossary of star names, the solar system, time, precession, lunar phases and eclipses, asteroids, comets and meteors, distance, and nearest and brightest stars. A chronology of space exploration appears at the end.

P

Page, Lou Williams, and Thornton Page. *Apollo-Soyuz Pamphlets.* NASA EP-133-141. US GPO, 1977 (Out of Print). Set of nine pamphlets. Average 60 pages each. Color and b/w photos, diagrams. Glossary. Bibliography. Secondary and adult.

A series of curriculum supplements for use at the high school level and up that combines descriptions of the history-making Apollo-Soyuz Test Project, the goals of the international mission, the experiments carried out, and the results, with questions for discussion, activity ideas, and relevance to standard textbook material. The material in each pamphlet was reviewed by a panel of thirty-nine high school and university teachers and scientific investigators. Each includes International System units, a glossary, and suggestions for further reading.

Apollo-Soyuz Pamphlet No. 1: The Flight. NASA EP-133. ASTP was an international meeting in space. The main new piece of equipment required was a special Docking Module that allowed the men to pass between the different atmospheres of the American and Soviet craft. The timing of launch, control, and rendezvous was vital. The experiments carried out during the flight are described briefly in this general overview.

Apollo-Soyuz Pamphlet No. 2: X-Rays, Gamma-Rays. NASA EP-134. An introduction to high-energy astrophysics, how radiation detectors work, and a history of discoveries of X-ray and gamma-ray sources in space. The specific experiments carried out on the ASTP flight discovered new X-ray emission sources, almost confirming the existence of black holes and neutron stars.

Apollo-Soyuz Pamphlet No. 3: Sun, Stars, In Between. NASA EP-135. Three experiments carried out during the ASTP involved interstellar gases, including those around our Sun. The structure of the Sun is described as background for the experiment in which Apollo and Soyuz separated and the Apollo craft was positioned so as to eclipse the Sun for Soyuz, and the outer corona could be photographed. A special telescope was used to detect extreme ultraviolet radiation from stars; several "super hot" stars were located. A third investigation mapped the presence of helium in space.

Apollo-Soyuz Pamphlet No. 4: Gravitational Field. NASA EP-136. Two ASTP experiments were directed toward detecting gravitational anomalies, regions of higher or lower g than normal through the motion changes made by spacecraft in orbit. Such plotting of anomalies may lead to the discovery of ore deposits, coal, oil, and gas in the Earth's crust.

Apollo-Soyuz Pamphlet No. 5: The Earth from Orbit. NASA EP-137. The astronauts abroad Apollo-Soyuz checked out various cameras for use in Earth photography as well as their own observational ability at identifying surface features. In addition, measurements were made of aerosols in the stratosphere and oxygen and nitrogen in the outer atmosphere.

Apollo-Soyuz Pamphlet No. 6: Cosmic Ray Dosage. NASA EP-138. In anticipation of long-duration manned flights, investigators continue to check out the possibility of hazard from cosmic rays. The ASTP flight included timing and descriptions by astronauts of the light flashes often perceived by humans in space flight, thought to be cosmic rays striking the retina of the eye. In addition, a variety of small organisms such as bacterial spores, seeds, and eggs were carried on the flight and exposed to cosmic rays.

Apollo-Soyuz Pamphlet No. 7: Biology in Zero-G. NASA EP-139. Another aspect of space that can affect living organisms is weightlessness. Seven biological experiments pertaining to zero gravity were carried out during ASTP. They involved orientation without an up or down of fish hatchlings, the effect of weightlessness on cyclical patterns, and separation of different living cells by electrophoresis. Other experiments involved the astronauts themselves: how human microbes were transferred between the men during flight and whether an astronaut's immunity changed during the space flight.

Apollo-Soyuz Pamphlet No. 8: Zero-G Technology. NASA EP-140. A variety of experiments involving manufacturing techniques in weightlessness were carried out during the ASTP mission. Metallurgical processing, for example, may be of future value in space colonies. Other processes investigated include the behavior of liquids, high-temperature metal processing, and growing crystals.

Apollo-Soyuz Pamphlet No. 9: General Science. NASA EP-141. The final volume in the series contains the highlights of the previous eight pamphlets, introducing each of the experiment subjects to a lesser extent and, in effect, summarizing the complete activities of the ASTP mission.

Page, Thornton, and Lou Williams Page, editors. *Space Science and Astronomy: Escape from Earth.* Sky and Telescope Library of Astronomy Vol. 9. Macmillan, 1976. LC# 76-5879. ISBN 0-02-594310-3. 467pp. B/w photos and diagrams. Index. Glossary. Bibliography. Secondary and adult.

A comprehensive collection of articles, taken from the magazine *Sky and Telescope*, covering 1) Concepts of the Space Age; 2) Early Flights and the Hazards of Space; 3) Exploring the Moon and its History; 4) Trips to Venus and Mercury; 5) Preparation for Landing on Mars; 6) Close-up Views of Jupiter; 7) Spacecraft Design and Workshops in Space; 8) Optical Observations of the Sun, Earth and Stars; 9) X-ray and Gamma-Ray Astronomy; and 10) The Frontiers of Space. An appendix gives a chronology of the space program through August 1975.

Pananides, Nicholas A., and Thomas Arny. *Introductory Astronomy*. Second edition. Addison-Wesley, 1979. LC# 78-55825. ISBN 0-201-05674-7. 388pp. Color and b/w photos, diagrams. Index. Glossary. Adult.

An introductory textbook for nonscience majors that concentrates on the basic principles of astronomy, in nontechnical language and with little mathematics, on the assumption that when they have been absorbed "the real beauty of astronomy [will] reveal itself." The pattern is traditional, starting with the history and tools of astronomy, exploring the solar system, and then moving to the Sun and other stars, ending with a look at cosmology. The material is broken up into short, numbered sections. Each chapter ends with a summary and review questions. A great deal of data on the stars is given in the appendixes.

Pasachoff, Jay M. *Astronomy: From the Earth to the Universe*. Golden Sunburst series. Saunders, 1979. LC# 79-3949. ISBN 0-7216-7112-8. 559pp. Index. Color plates, b/w photos and diagrams. Glossary. Bibliography. Adult.

A treatment of the same topics on the same level as *Astronomy Now* (see below) except that it covers the history of astronomy and the planets first. It also includes additional material on naked-eye observing. The Student Study Guide for *Astronomy Now* is usable with this volume. Both of these books are shortened versions of the author's *Contemporary Astronomy*.

________. *Astronomy Now*. Golden Sunburst series. Saunders, 1978. LC# 77-84678. ISBN 0-7216-7100-4. 430pp. Color and b/w photos. Index. Glossary. Bibliography. Student Study Guide available: ISBN 0-7216-7102-0. Adult.

A nonmathematical textbook emphasizing contemporary discovery and thought in astronomy. It starts with the universe as a whole, looks at the lives of stars, new subjects such as pulsars, neutron stars, and black holes. Then it moves in on our solar system, finally outward again to the galaxies and beyond, with a final study of cosmology and what's happening now in astronomy. Each chapter concludes with an outline, questions, and topics for discussion. A Teacher's Guide is available.

________. *Contemporary Astronomy*. Second edition. Golden Sunburst series. Saunders, 1981. LC# 80-53923. ISBN 0-03-057861-2. 620pp. Color and b/w photos, diagrams. Glossary. Index. Bibliography. Adult.

A heavily illustrated, quite interesting textbook for the beginning but nonmathematical student, with strong concentration on recent discoveries about our solar system. A great deal of information on historical sidelights and personalities enlivens the text. Like the previous two books, this emphasizes public-interest subjects since those are often what prompted the student to sign up for the course. Chapters end with a summary and outline, as well as thought-provoking questions.

Paul, Gunter. *The Satellite Spin-off: The Achievements of Space Flight*. Luce, 1975. LC# 75-11369. ISBN 0-88331-076-7. 272pp. B/w photos. Index. Secondary and adult.

A German physicist involved in extraterrestrial research has provided an enlightening, readable coverage of the evolution of experimental programs such as communications and weather satellites into the fully operational programs of today. Earth research leading to navigational systems and remote sensing for a constantly growing variety of uses are among the satellite spinoffs described.

Paul, Henry E. *Outer Space Photography for the Amateur*. Fourth edition. Amphoto, 1976. LC# 67-21698. ISBN 0-8174-2407-5. 156pp. B/w photos. Index. Glossary. Secondary and adult.

An outstanding amateur photographer of outer space has prepared this volume based on the latest technology and in consultation with other amateur and professional photographers of the heavens. Clearly written and profusely illustrated, this book starts with the basics of equipment and deals in turn with photographing star trails, satellites, Moon, Sun, eclipses, stars and nebulas, meteors, and planets. A special chapter deals with color photography.

Pelton, Joseph N. *Global Communication Satellite Policy: INTELSAT, Politics and Functionalism*. Lomond, 1974. LC# 74-77976. ISBN 0-912338-32-6. 183pp. Index. Foreword by Eric Burgess. Bibliography.

A detailed analysis of the International Telecommunications Satellite Consortium (INTELSAT) agreements, which, Burgess says in the Foreword, "provide a key to human survival by broadening concepts of global cooperation and pointing a way for others to follow."

Pelton, Joseph N., and Marcellus S. Snow, editors. *Economic and Policy Problems in Satellite Communications*. Special Studies in International Economics and Development series. Praeger, 1976. LC# 75-44937. ISBN 0-275-23730-3. 246pp. Index. Adult.

Discusses key issues in satellite communications, defining the problems, establishing a theoretical background, analyzing proposed solutions, and suggesting actions to be taken. An appendix describes existing and planned world communications satellite systems.

Pennsylvania Bureau of Curriculum Services. *Earth and Space Science: A Guide for Secondary Teachers*. Pennsylvania Dept. of Education, 1973. 194pp. B/w diagrams. Adult.

A guide to fundamentals, rather than an actual course of study, this book provides, primarily by question-and-answer method, the information and activities a teacher needs fully to incorporate the concepts concerning Earth, oceans, space environment, atmosphere, and exploration of space into other curricular areas.

Pensée, editors of. *Velikovsky Reconsidered.* Doubleday, 1975. LC# 74-33637. Hardcover ISBN 0-83-03118-1. Paperbound ISBN 0-446-82358-9 from Warner. 260pp. Index. Secondary and adult.

A collection of articles that appeared in *Pensée,* the magazine of the Student Academic Freedom Forum, seeking "fair play." The concern of some of the articles is directed more toward the treatment of Velikovsky's ideas on the solar system received from scientists than on the growing affirmation of some of the ideas.

Petrillo, Anthony J. *What's the Use of Land?* NASA EP-103. US GPO, 1977. Stock no. 3300-00665-9. 64pp. B/w photos and diagrams. Bibliography. Adult.

This secondary school social studies report demonstrates how photos of Earth taken by satellites can be combined with information from other sources to aid in the teaching of school curriculum topics. The project was developed by the Jefferson County, Colorado, Public Schools' Interdisciplinary Environmental Education Team led by Petrillo. Tearout pages contain illustrations useful for classroom work and as originals for projection transparencies.

Pickering, James S. *1001 Questions Answered about Astronomy.* Revised edition. Dodd, Mead, 1975. LC# 75-4045. ISBN 0-396-07184-8. 420pp. B/w photos. Index. Bibliography. Upper and up.

The 1001 Questions books start with the most elementary questions, answer them simply, and gradually become more complex, building on what has gone before. There is very little illustration in the 1048 questions answered in this volume, but a great deal of information is provided on the Sun, Earth and Moon, planets, motions, stars, galaxies, techniques of astronomy including spaceflight, mechanics and physics, and the astronomers.

Pizzey, Stephen. *Exploring: Remote Sensing.* HMSO, 1977. ISBN 0-11-290280-4. 32pp. Color and b/w photos, b/w art. Upper and up.

One of a series of booklets developed for an Exploration Exhibition at the Science Museum of the British Museum. This one describes the new techniques of viewing our world literally in a new light. Thermal imaging, radar, aerial and space photography, and multispectral imaging are illustrated and described.

________. *Exploring: The Solar System.* HMSO, 1977. ISBN 0-11-290277-4. 28pp. Color and b/w photos, diagrams. Upper and up.

Another exhibition booklet, this one describing what has been learned about our solar system, primarily through space technology. The photos used have been carefully selected to highlight the discoveries made.

Polcyn, Kenneth A. *An Educator's Guide to Communication Satellite Technology.* Andromeda Books, 1973. LC# 73-89216. 100pp. B/w drawings. Index. Glossary. Bibliography. Adult.

A guide for educational planners to the technology breakthroughs that could revolutionize education in coming years. The nature of communication satellites and the educational experimentation of the 1970s are described.

Ponnamperuma, Cyril, and A. G. W. Cameron, editors. *Interstellar Communication: Scientific Perspectives.* Houghton Mifflin, 1974. LC# 73-11945. ISBN 0-395-17809-6. 226pp. B/w photos and diagrams. Bibliography. Adult.

A paperbound collection of lectures given at the NASA Ames Research Center by specialists in the fields involved in the study of extraterrestrial life. A general view of the interstellar communication problem is followed by considerations of the most likely locations of other life in the universe, the forms it might take, and the technical aspects of communicating. An extensive bibliography is arranged by subject: probability of extrasolar intelligence; methods of communicating; philosophical, psychological, and sociological questions; bibliographies and multitopic books; and miscellaneous.

Porter, Richard. W. *The Versatile Satellite.* Oxford, 1977. LC# 0-19-885104-9. 173pp. Color and b/w photos, diagrams. Index. Adult.

A basic and complete description of the history of artificial satellites (including manned), the various ways they can be used for observations, and their potential for the future. Covers both American and Soviet activities. The more complex mathematics of satellite motion is in an appendix.

Posthuma, Fredrick E., editor. *Energy and Education: Teaching Alternatives.* NEA Aspects of Learning series. National Education Assn., 1978. NEA stock numbers: hardcover 1493-6-00, paperbound 1492-8-00. 144pp. Bibliography. Adult.

A collection of brief articles from a variety of sources both inside and outside education on subjects and methods of energy education. Several mini-units and lesson plans are given as is a bibliography of available materials.

Powers, Robert M. *Planetary Encounters: The Future of Unmanned Spaceflight.* Stackpole, 1978. LC# 78-16516. ISBN 0-8117-1270-2. 192pp. Color and b/w photos, and art by Helen Zane Jensen. Index. Glossary. Bibliography. Secondary and adult.

Reports how the new generation of unmanned spacecraft and probes are mapping out new worlds before piloted spacecraft are launched into the vast expanse of deep space. The book shows that these machines are really technological extensions of our senses and our urge to probe into the universe. What has been accomplished so far and the missions proposed for the future are described.

________. *Shuttle: The World's First Spaceship.* Stackpole, 1979. LC# 79-652. Hardcover ISBN 0-8117-1686-4. Paperbound ISBN 0-8117-2112-4. 256pp. Color and b/w photos, drawings. Index. Glossary. Foreword by Michael Collins. Secondary and adult.

The author calls the Space Shuttle "the key to the technology of the next century" and notes that it is "the key to a sprawling tumble of outward expansion to meet the unknowns of the universe." This heavily illustrated guide to the Shuttle and its potential can serve both as a handy reference guide to Shuttle watchers in coming years or as a tool for dreaming of what is possible in space.

Priestley, Lee. *America's Space Shuttle.* Messner, 1978. LC# 78-15963. ISBN 0-671-32947-2. 96pp. B/w photos and art. Index. Glossary. Foreword by Ben Boykin, Shuttle Project Director. Intermediate.

A new generation of space exploration began with the rollout of *Enterprise,* the first Space Shuttle, in 1977. This book answers the main questions about this great new enterprise and conveys much of the excitement that scientists and others find in the new facility.

Protheroe, W. M., E. R. Capriotti, and G. H. Newsom. *Exploring the Universe.* Merrill, 1979. LC# 78-60353. ISBN 0-675-08313-3. 448pp. Color and b/w photos, diagrams. Index. Glossary. Bibliography. Adult.

A textbook for a one-term course for nonscience majors that emphasizes the historical approach to astronomy. Astronomical knowledge is introduced basically in the order in which it was discovered. Two chapters are devoted to the nature of light, treated mathematically, and the tools of the astronomer. Then the student moves outward from the planets to the stars to the galaxies, with final thoughts on the nature of the universe. Each chapter ends with a list of key terms and review and discussion questions.

Q

Quackenbush, Robert. *The Boy Who Dreamed of Rockets.* Parents, 1978. LC# 78-21882. Trade ISBN 0-8193-0995-8. Library binding ISBN 0-8193-0996-6. 36pp. Color art by the author. Primary and intermediate.

An author/illustrator tells the story of how Robert H. Goddard became the "Father of the Space Age." The full-color art makes a diary of major events, while small cartoon drawings ask and answer questions that supplement the text. The book concludes with instructions for building a model rocket and an explanation of how a rocket works.

R

Rector, William F., III, and Paul A. Enzo, editors. *Space Shuttle: Dawn of an Era.* Vol. 41, Parts I and II, in the AAS Advances in the Astronautical Sciences series. AAS, 1980. LC# 57-43769. Hardbound ISBN: Vol. I 0-87703-111-8; Vol. II 0-87703-113-4. Paperbound ISBN: Vol. I 0-87703-112-6; Vol. II 0-87703-114-2. 980pp. total. B/w photos and diagrams. Adult.

Proceedings of the Twenty-sixth AAS Annual Conference, held in 1979 in Los Angeles. Part I includes the session on the Shuttle elements and operations, such as military applications, man in the Shuttle, industrial use, and plans for an advanced Shuttle. Part II deals with payloads and space medicine.

Reed, Millard. *Solar Energy for Tomorrow's World.* Messner, 1980. LC# 79-25256. ISBN 0-671-33043-8. 188pp. B/w photos. Index. Glossary. Bibliography. Upper and secondary.

"The Sun's shining promise" will be kept in future years by a wide variety of devices to capture and use the energy in the Sun's rays, in wind power, and from the biomass, that energy contained within biological materials. This book explores the future, leading to solar power plants in space.

Riabchikov, Evgeny. *Russians in Space.* Doubleday, 1971. LC# 70-144291. 300pp. B/w photos. Secondary and adult.

This is the Russians' own story, developed by Novosti Press Agency, of their space program. Told in anecdotal style and illustrated with photos not often seen in the West, the book relates the history of their early inventors, the events leading to Sputnik, and then the flight of Yuri Gagarin, first man into space. Each flight after that is detailed, with the kind of behind-the-scenes information not available before.

Richardson, Robert S. *The Stars and Serendipity.* Pantheon, 1971. LC# 70-77435. Trade ISBN 0-394-82022-3. Library binding ISBN 0-394-92022-3. 129pp. B/w photos and art. Glossary. Upper and secondary.

In an effort to make the explanations of science seem less facile then they often do, an astronomer demonstrates that many of the great discoveries were wholly unpredicted. First he explains the origin of the word "serendipity," then describes the ways in which happy surprises have come to scientists hard at work and how they have advanced astronomical knowledge. The most recent example is that of the discovery of the pulsar.

Richason, Benjamin F., Jr., editor. *Introduction to Remote Sensing of the Environment.* A National Council of Geographic Education Pacesetter Book. Kendall/Hunt, 1978. LC# 77-92936. ISBN 0-8403-1837-5. 510pp. Color and b/w photos, diagrams. Index. Bibliography. Laboratory Manual available: ISBN 0-8403-1898-7. Adult.

An introductory textbook in a rapidly maturing field, using only the basic physics required for understanding the technology of the devices used. Because remote sensing techniques are applied in so many fields, each chapter was written by a specialist in his own area. Several chapters cover the collection of baseline data in Gemini, Apollo, Skylab, and Landsat programs. Half the book deals with applications. The appendixes include sources of imagery and a section of color plates.

Rickert, Russell K. *Astronomy and Space Exploration.* Addison-Wesley, 1974. ISBN 0-201-06431-6. 342pp. B/w photos and diagrams. Index. Adult.

An introductory textbook for nonscience majors that emphasizes "how do we know?" instead of the facts and data of the subjects. The reader is intended to participate in the search for the meaning of the universe, a quest that will never be ended. Each chapter ends with stimulating questions. A final chapter asks: Are we alone?

Ridpath, Ian. *Messages from the Stars: Communication and Contact with Extraterrestrial Life.* Harper & Row, 1978. LC# 78-2160. Hardcover ISBN 0-06-013589-1. Paperbound ISBN 0-06-090734-7. 241pp. Index. Secondary and adult.

A look at the scientific basis for belief that life does exist elsewhere in the universe. Current and proposed attempts to discover it, as well as the scientists involved, are described. The consequences of our actually going into space to search out other life forms are speculated on.

________. *Stars and Planets.* Hamlyn, 1978. ISBN 0-600-38258-3. 94pp. Color and b/w photos and art. Index. Upper and up.

A large-sized book of beautiful photos and lively text covering the history of astronomy, the contemporary discoveries about our solar system, and the details we are learning about our Sun and other stars. It concludes with our changing picture of the universe as a whole.

________. *Worlds Beyond: A Report on the Search for Life in Space.* Harper & Row, 1976. LC# 75-30344. ISBN 0-06-013568-9. 176pp. B/w photos and diagrams. Index. Upper and secondary.

After describing the possibility of our having neighbors, this paperbound book describes Earth-man's past and possible future. The solar system is explored with a view toward other life. The programs to communicate with the stars are described, as well as the possibility of travel to them. He concludes with a brief look at UFOs. The wide-margin format of this book allows abundant use of diagrams to clarify text and photos.

Roberts, Burgert. *Spacewalks: Poems for the Moon Age.* Harper & Row, 1971. LC# 70-156546. ISBN 0-06-013571-9. 90pp. B/w art by the author. General.

This is the way the World wakes,
not with Godot but Apollo.

This poet, "inspired by astronomy, astrology, ancient religions, and, most of all, by Apollo," believes "another renaissance is dawning through the new dimension created by space travel."

Robinson, George S. *Living in Outer Space.* Public Affairs Press, 1976. LC# 75-29566. ISBN 0-8183-0243-7. 119pp. Index. Introduction by Isaac Asimov. Adult.

Many books on space colonization are available to describe the technology and prospective "daily life" of the colonizers. This book by a general counsel for the Smithsonian Institution explores the biological foundation of law in space communities. In essence, he says that experience has already shown "that long-duration space crewmen must be considered somewhat alien to the earthbound humans, not only biologically but in certain value formations and judgement patterns as well." An entire new system of law and culture will need to be developed for spacekind.

Rohr, Hans. *The Beauty of the Universe.* Translated and revised by Arthur Beer. Viking, 1972. LC# 77-164990. ISBN 0-670-15340-0. Color and b/w photos. Foreword by Arthur A. Hoag, Kitt Peak National Observatory. Secondary and adult.

The author, a Swiss astronomer, has chosen from among the most interesting astronomical photographs a selection that will cause the reader "to wonder more about the mysteries of the skies." Includes both earthly telescopic and spacecraft photos.

Ronan, Colin. *Invisible Astronomy.* Lippincott, 1972. LC# 78-165154. 173pp. B/w photos and diagrams. Index. Foreword by Fred Hoyle. Adult.

An exploration of the new astronomy since it became clear that a great deal more can be learned about our universe than is available with visible light. The author introduces the theory of the electromagnetic spectrum, shows how the various components are utilized and what has been discovered. In addition, he discusses the whole new category of astronomical problems that has arisen on the frontier of science.

Rosen, Stephen. *Future Facts.* Simon & Schuster, 1976. LC# 75-15545. Hardcover ISBN 0-671-22078-0. Paperbound ISBN 0-671-22756-4. 535pp. B/w drawings. Index. Secondary and adult.

The author, an astrophysicist serving as a consultant on new products and futures, provides "a Forecast of the World as we will know it before the end of the century." This large collection of brief items covers projected ideas for every facet of our lives from obesity control to telecommunications by "meson beam." Leisuretime, business, transportation, agriculture, society, environment, and health are among the areas covered.

Rosenfeld, Sam. *Science Experiments for the Space Age.* Harvey House, 1972. LC# 70-185061. Trade ISBN 0-8178-4881-9. Library binding ISBN 0-8178-4882-7. 190pp. B/w photos, art by Anne Lewis. Index. Glossary. Bibliography. Intermediate and up.

A progressive series of experiments, using easily obtainable materials, that takes the readers far out from Earth (which they prove is turning) to the Moon (whose distance is calculated) to the stars (whose brightness in measured). In between, motion and energy are studied, as are the space environment and orbital mechanics. Each of fourteen subjects is discussed and a self-test is given, with explanations of the answers.

Ross, Dave. *Making Space Puppets.* An Easy-Read Activity Book. Watts, 1980. LC# 80-11846. ISBN 0-531-04143-3. 32pp. Color art by the author. Intermediate.

Puppets of space creatures can be made from your hand, fingers, paper plates, milk cartons, and paper bags. The really imaginative child can create them from papier maché and cloth. Instructions for making a puppet theatre and putting on a play are also given.

Ross, Frank, Jr., *Space Shuttle: Its Story and How to Make a Flying Paper Model.* Lothrop, 1979. LC# 79-12155. Trade ISBN 0-688-41882-1. Library binding ISBN 0-688-51882-6. 96pp. B/w photos. Index. Glossary. Intermediate and upper.

An illustrated coverage of the space transportation system, with considerable detail on the function of various parts. Many photos are included of proposed space equipment that might be handled by the Shuttle. Helpful drawings, mainly to scale, show just how to make a paper model that should fly.

Rovin, Jeff. *Mars!* Corwin Books, 1978. LC# 77-15949. ISBN 0-89474-011-3. 244pp. B/w photos and art. Index. Introduction by Ben Bova. Secondary and adult.

A book that freely admits that the Viking landing on Mars did not release imagination's grip on the Red Planet. Starting with fact and early astronomy, the author then moves to Martians in fiction. The second half of the paperbound book fully describes and illustrates the Viking landings.

Rowan-Robinson, Michael. *Cosmic Landscape: Voyages Back along the Photon's Track.* Oxford, 1979. LC# 79-41327. ISBN 0-19-857553-X. 149pp. Index. Glossary. Adult.

The recent discoveries of nonoptical astronomy have changed man's view of the universe. This volume explains for laypersons the technicalities of how the discoveries were made: the various landscapes "seen" in the different portions of the electromagnetic spectrum: visible, radio, ultraviolet, X-ray and gamma ray, infrared, and microwave.

Rubinger, Michael. *I Know an Astronaut.* A Community Helper Book. Putnam, 1972. LC# 74-166989. Trade 0-399-20281-3. Library binding ISBN 0-399-60713-7. 48pp. Two-color art by Joel Snyder. Illustrated glossary. Primary.

The story-teller's uncle is an astronaut. He takes young readers on a tour of the Space Center where his training and work are explained. A simple illustrated glossary directs the reader to the page on which the object is described.

Rudd, Robert D. *Remote Sensing: A Better View.* The Man-Environment System in the Late 20th Century series. Duxbury, 1974. LC# 74-75714. ISBN 0-87872-068-5. 135pp. Color and b/w photos. Index. Bibliography. Secondary and adult.

The author, a remote sensing expert, writes nontechnically for the lay public, describing the "quiet revolution" by which we've obtained a better view of Earth. Excellent color examples of the photography are shown, illustrating the basics, our natural environment, man's use of the technology, and its potential. Both the pros and cons are discussed.

Rutland, Jonathan. *Exploring the Planets.* An Explorer Book. Warwick, 1978. LC# 78-51049. Trade ISBN 0-531-09092-2. Library binding ISBN 0-531-09103-1. 24pp. Color art. Intermediate.

The family of the Sun is illustrated and described briefly. Then the techniques of exploring the solar system are shown, with earthbound methods, manned spacecraft, planetary probes, and space stations.

Ryan, Peter, and Ludek Pesek. *Solar System.* Viking, 1978. LC# 78-15382. ISBN 0-670-65636-4. 224pp. Color and b/w photos, color art by Ludek Pesek. Index. Foreword by Carl Sagan. Secondary and adult.

A guidebook for the space traveler of the future, with dramatic text and vivid, accurate artwork detailing what is known. The Sun, focal point of the system, is fully explored, as is each planet in turn, ending with the millions of comets that fringe our planetary world. The photos and extraordinary artwork receive full play, often being given two-page spreads.

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Safford, Edward L., Jr. *Advanced Radio Control including Rockets and Robots.* Second edition. Tab Books, 1980. No. 1222. LC# 79-25621. Hardcover ISBN 0-8306-9948-1. Paperbound ISBN 0-8306-1222-X. 266pp. B/w photos and diagrams. Index. Secondary and adult.

Presents the theory as well as practical do-it-yourself information for building radio-controlled airplanes, sailplanes, helicopters, rockets, and simple robots.

Sagan, Carl. *Broca's Brain: Reflections on the Romance of Science.* Random House, 1979. LC# 78-21810. Hardcover ISBN 0-394-50169-1. Paperbound ISBN 0-345-28823-8 from Ballantine. 347pp. Index. Adult.

Sagan discusses fundamental questions: "the origins of consciousness; life on our planet; the beginnings of earth; the formation of the Sun; the possibility of intelligent beings somewhere up there in the depths of the sky; as well as the grandest inquiry of all—on the advent, nature and ultimate destiny of the universe." In addition, he gives his answer to some of the borderline pop "sciences."

________. *The Cosmic Connection: An Extraterrestrial Perspective.* Anchor Press/Doubleday, 1973. LC# 73-81117. Hardcover ISBN 0-385-00457-5. Paperbound ISBN 0-440-13301-7 from Dell. 274pp. B/w photos. Index. Secondary and adult.

A collection of viewpoint-changing essays that turn the reader into a thoughtful inhabitant of the universe instead just of Earth, a small planet "in the boondocks." Extraterrestrial life, the puzzles of radio astronomy, thoughts on teaching astronomy to young children, the human enterprise of space exploration, revamping the solar system for our benefit—such are the diverse subjects Sagan discusses.

________. *Cosmos.* Random House, 1980. LC# 80-5286. ISBN 0-394-50294-9. 365pp. Color and b/w photos and art. Index. Bibliography. Secondary and adult.

A book based on, but not strictly repeating, the 1980 Public Television series "Cosmos," that tells the story of our discovery of the universe. It relates how we are exploring with modern ground- and space-based instruments our solar system and beyond. The final portion describes the probability of galactic civilizations and our own search for them. The illustrations are lively and relevant.

________. *The Dragons of Eden: Speculations on the Evolution of Human Intelligence.* Random House, 1977. LC# 76-53472. Hardcover ISBN 0-394-41045-9. Paperbound ISBN 0-345-26031-7 from Ballantine. 263pp. B/w photos and drawings. Index. Glossary. Bibliography. Adult.

This planetary scientist and exobiologist presents a view of the development of the mind, including a perspective on the future evolution of the brain. It leads to a discussion of why other intelligent beings will be sufficiently like us intellectually to permit interstellar communication.

________. *Other Worlds.* Bantam, 1975. 160pp. B/w photos and art. Upper and up.

A small collection of illustrated essays, cartoons, poetry, dramatic photos, and artwork to do with space research, our solar system, and insights into the universe.

Sagan, Carl, et al. *Murmurs of Earth: The Voyager Interstellar Record.* Random House, 1978. LC# 77-5991. Hardcover ISBN 0-394-31047-5. Paperbound ISBN 0-394-28396-1. 276pp. Color and b/w photos. Index. Secondary and adult.

In 1977, two Voyager spacecraft were launched to explore the outer planets and then leave the solar system for the stars. This book is an account of the development of the gold-coated copper phonograph record attached to the leg of each craft bearing "murmurs of Earth" for a stellar being who might find it some distant day. People from all over became involved in the process that selected 118 photos of Earth (encoded as a sound signal), great music, greetings in sixty languages (plus whale sounds), and an "audio essay" of the sounds of daily living on Earth.

Sagan, Carl, and I. S. Shklovskii, editors. *Communication with Extraterrestrial Intelligence (CETI).* MIT Press, 1973. LC# 73-13999. Hardcover ISBN 0-262-19106-7. Paperbound ISBN 0-262-69037-3. 428pp. B/w diagrams. Index. Adult.

Proceedings of a 1971 conference held jointly by the United States and the Soviet Union. This volume has become the most complete, basic reference on exobiology and incorporates both the lectures and the discussions during the conference.

Saltrick, Daniel F., Alfred M. Kabota, and Robert L. Cannon. *Aerospace Education and Model Rocketry.* Second edition. Estes, 1975. 36pp. B/w photos and art. Bibliography. Secondary and adult.

Objectives, techniques, and preparation for using model rocketry as an aerospace education tool in the intermediate grades. Experiments and activities for understanding the science involved in rocket flight are included.

Sanderson. *Aviation/Aerospace Fundamentals.* Jeppesen Sanderson, 1980. Sixth edition. LC# 0-88487-059-6. 731pp. B/w photos and diagrams. Index. Glossary. Student exercise book available: ISBN 0-88487-060-X. Secondary and adult.

A solid introductory textbook on aviation history, the science of flight, weather, communications, navigation, space, and rocketry. Liberally illustrated with photos and diagrams, the text is nontechnical in nature, using mathematics only in flight problems required of all pilots. Each chapter concludes with a series of activities that reinforces the learning.

Sandler, Harold, and David L. Winter. *Physiological Responses of Women to Simulated Weightlessness.* NASA SP-430. 1978. Available from NTIS, N79-136686. 87pp. B/w photos and graphs. Adult.

This is a review of the significant findings of a pioneering study on a group of female subjects studied under simulated spaceflight conditions, conducted at NASA's Ames Research Center. The subjects, twelve Air Force nurses and reservists, went through a fourteen-day base-data control period, seventeen days of absolute bedrest (four women remained up as controls), plus six days of recovery.

Sarnoff, Jane, and Reynold Ruffins. *Space: A Fact and Riddle Book.* Scribners, 1975. LC# 78-11499. ISBN 0-684-15898-1. 32pp. Color art by Reynold Ruffins. Glossary. Primary and intermediate.

Even the youngest reader will find delight in the riddles, with such gems as: Why does the Sun always win arguments with the rain? Because it makes the rain dry up! Or even more relevant, Why don't sophisticated people go to the Moon for vacations. Because it doesn't have the right atmosphere. Older children will find just as much fascination in the pages that describe the planets and other bodies in our solar system. It ends with a view of living in space.

Schauer, William H. *The Politics of Space: A Comparison of the Soviet and American Space Programs.* Holmes & Meier, 1976. LC# 74-84657. ISBN 0-8419-0185-6. 317pp. Index. Bibliography. Adult.

A comprehensive account of the politics and administrative history of the space race. It goes beyond a simple description of each nation's efforts in space exploration and analyzes the motives as well as the impact of space activities on the economy, military planning, and foreign policies of each country. A very thorough bibliography is included.

Schecter, Darrow. *I Can Read about Planets.* Revised edition. I Can Read About series. Troll Associates, 1979. LC# 78-66272. ISBN 0-89375-215-0. 48pp. Two-color art by Joel Snyder. Primary and intermediate.

A simple paperbound introduction to our solar system in which text is closely integrated into the art. Each planet is briefly described, using the most recent discoveries from the space program.

Schleicher, Robert. *The ETV Model Book.* Chilton, 1979. LC# 78-14626. Hardcover ISBN 0-8019-6800-3. Paperbound ISBN 0-8019-6801-1. 181pp. B/w photos and art. Glossary. Upper and secondary.

A book to help turn two-dimensional past, future, or imaginary extraterrestrial (space) vehicles into three-dimensional models. Everything from simple model kits to flying model rockets to creating ground-effect machines for exploring strange planets is included. All the instructions are illustrated with photos of processes involved or finished models.

Schneider, William C., editor. *Bicentennial Space Symposium: New Themes for Space.* Vol. 35 in the AAS Advances in the Astronautical Sciences series. AAS, 1977. LC# 57-43769. ISBN 0-87703-090-1. 229pp. B/w diagrams. Adult.

"New Themes in Space: Mankind's Future Needs and Aspirations" was the theme of the Twenty-second AAS Annual Meeting, held in 1976 in Washington, D.C. Sixteen papers were presented in four different subjects: 1) Mankind's Environment: the need to know our universe; 2) Mankind's Communication: the need to know each other; 3) Mankind's Commerce: the industrialization of space; and 4) Mankind's Resources: the need to augment Earth's stores.

Schneider, William C., and Thomas E. Hanes, editors. *The Skylab Results.* Vol. 31, Parts I and II, in the AAS Advances in the Astronautical Sciences series. AAS, 1975. LC# 0-87703-072-3. 1146pp. total. B/w photos and diagrams. Adult.

Proceedings of the Twentieth AAS Annual Meeting, held in 1974 in Los Angeles. An authoritative description of the findings of the Skylab missions by the scientists and engineers most intimately involved in the program to explore the usefulness of spaceflight for man's endeavors on Earth. The major topics include: Integration and Testing, Skylab Operations Support, Living and Working in Space, Skylab Technology, Earth Resources Experiments Package, Kennedy Space Center Role, Student Science Program, Corollary Experiments, Apollo Telescope Mount Experiments, and Life Sciences.

Schwartz, Julius. *Earthwatch: Space-Time Investigations with a Globe.* McGraw-Hill, 1977. LC# 76-30334. ISBN 0-07-055685-7. 64pp. B/w art by Radu Vero. Index. Bibliography. Upper.

An unusual book using the globe as an instrument for investigating Earth's journeys through time and space. Day and night, lunar phases, temperature variations, sundials, planetary rotation, and eclipses are some of the concepts illustrated by the active reader.

Schwartz, Mortimer D., editor. *Space Law Perspectives.* Rothman, 1976. LC# 76-26814. ISBN 0-8377-1106-1. 302pp. Adult.

Commentaries based on the 1957-1972 Colloquia on the Law of Outer Space, sponsored by the International Institute of Space Law. Each chapter reproduces significant papers, or abstracts them, from each colloquium and comments on them. Only one chapter is not in English. Legal language is kept to a minimum and a layperson can find much here that will play an increasingly significant role as human use of space expands.

Scientific American. *The Solar System: A Scientific American Book.* Freeman, 1975. LC# 75-28113. Hardcover ISBN 0-7167-0551-6. Paperbound ISBN 0-7167-0550-8. 145pp. Color and b/w photos, diagrams. Adult.

A reprint of the twelve articles—some fairly technical—that appeared in the September 1975 issue of *Scientific American*, updating our knowledge of the solar system, based on the most recent findings of the space program. The initial article by Carl Sagan presents the solar system as a whole and describes the role of space exploration in planetary astronomy. Other articles detail the Sun, the Moon, the closest planets individually, and the outer planets as a group, as well as meteorites, comets, asteroids, and interplanetary particles and fields.

Scott, John M. *Countdown to Encounter: Von Braun and the Astronauts.* Our Sunday Visitor, 1979. LC# 79-84534. ISBN 0-87973-630-5. 144pp. B/w photos. Upper and secondary.

The story of the manned space program through the first lunar landing, from the viewpoint of the inspirational qualities of the men involved. White, Aldrin, Armstrong, Irwin, Borman, and others—each contributed to uplifting the human spirit.

Seeds, Michael A., editor. *Astronomy: Selected Readings.* Benjamin/Cummings, 1980. LC# 79-20217. ISBN 0-8053-8531-2. 178pp. Color and b/w photos and art. Index. Adult.

A selection of eleven articles from *Astronomy* magazine, dedicated to prompting the student to see the universe as a whole. A table correlates each article to standard textbook chapters and each has review questions and suggested readings. The articles are: Early History of Planet Earth, Venus, Viking on Mars: Exciting Results, Jupiter, Why Do Planets Have Rings? Our Sun, Stellar Evolution, Swarms of Stars: Cosmic Calibrators, Beyond the Milky Way, The End of Time, and Are We the Only Intelligent Life in Our Galaxy?

Seevers, James A. *Space.* A Read About Book. Raintree, 1978. LC# 77-18976. ISBN 0-8393-0076-X. 48pp. Color art. Index. Pronouncing glossary. Bibliography. Primary.

A colorfully illustrated but straightforward introduction to space exploration. It shows how rockets get out there, why satellites orbit Earth, how astronauts went to the Moon, and what the Space Shuttle can do. It ends with an explanation of the metric system and quite comprehensive pronouncing glossary.

Service, Robert, and John M. Williams. *Space Exploration.* Boy Scout Merit Badge Pamphlet #3354. Boy Scouts, 1976. LC# 19-600. ISBN 0-8395-3354-3. 64pp. B/w photos. Bibliography. Upper and secondary.

This manual for a merit badge in space exploration begins with building and launching a model rocket. The text then explores the American space program, describes and gives a chronology of major manned and unmanned programs. The physical principles of spaceflight are explained and careers briefly explored.

Shaffer, Stephen M., and Lisa Robock Shaffer. *The Politics of International Cooperation: A Comparison of U.S. Experience in Space and in Security.* Vol. 17, Book 4, in Monograph Series in World Affairs. U. of Denver, 1980. LC# 80-12030. ISBN 0-87940-063-3. 76pp. Adult.

An exploration of the relationships between U.S. foreign activities and policies and U.S. cooperation with other nations in the scientific programs administered by NASA and the military security programs of the North Altantic Treaty Organization.

Shapp, Martha, and Charles Shapp. *Let's Find Out about the Moon.* Revised edition. Let's Find Out series. Watts, 1975. LC# 72-4414. ISBN 0-531-00101-6. 55pp. Two-color art by Yukio Tashiro. Primary.

A simple and straightforward picture of the Moon as we see it from Earth, as the Apollo astronauts saw it up close, and as it affects our lives on Earth.

_______. *Let's Find Out about the Sun.* Revised edition. Let's Find Out series. Watts, 1975. LC# 74-2996. ISBN 0-531-00047-8. 40pp. Color art by Stephanie Later. Primary.

A simple introduction to the Sun—far away, very large, very hot, center of Earth's revolution, reason for day and night, and the source of life. The text incorporates easy, clarifying activities.

Sharp, David. *Machines on the Move.* Looking Inside series. Rand McNally, 1977. LC# 76-9940. ISBN 0-528-82212-8. 64pp. Color art by the author. Upper and up.

An in-depth look, through the use of detailed cutaway views, at many important machines in the air, on the ground, and on the water. The entire Apollo-Saturn assembly is shown, as well as the Lunar Module. Ground vehicles include the extraordinary crawler-transporter used to move giant rockets at Cape Kennedy.

Sharpe, Mitchell R. *"It is I, Sea Gull": Valentina Tereshkova—First Woman in Space.* Crowell, 1975. LC# 74-14698. ISBN 0-690-00646-2. 214pp. B/w photos. Index. Upper and secondary.

A complete biography of the first woman to make a spaceflight, written with Soviet sources of information as well as photos supplied by the USSR of Valentina's childhood, training, flight, and subsequent marriage.

Shenfeld, Gary. *Famous Firsts in Space.* Famous Firsts series. Putnam, 1972. LC# 77-166987. ISBN 0-399-60160-0. 72pp. B/w photos. Index. Intermediate and upper.

Thirty-one famous firsts are illustrated and described, from the military use of rockets by the Chinese in 1232 through the 1969 lunar landing. Satellites, scientific studies, woman in space, walk in space, and rocketry events are included.

Shields, John Potter. *Introduction to Radio Astronomy.* Sams, 1976. LC# 75-32338. ISBN 0-672-21246-3. 96pp. B/w photos and diagrams. Adult.

A nontechnical discussion for laypersons of the history of radio astronomy, background information on the structure of the universe, classification of galaxies, and radio wave propagation. It details reception of extraterrestrial radio signals and types of antennas, as well as the newly discovered radio sources such as pulsars, quasars, and black holes. The last chapters of this paperbound volume explain how to construct several practical, low-cost radio telescopes.

Shipman, Harry L. *Black Holes, Quasars, and the Universe.* Second edition. Houghton, Mifflin, 1980. Hardcover ISBN 0-395-24374-2. Paperbound ISBN 0-395-25392-6. 300pp. B/w photos and diagrams. Index. Glossary. Bibliography. Adult.

Intended as either a textbook or a supplemental reading book, this is a combination of history, fact, and theory. The new discoveries of astronomy are discussed in readable, not-too-technical fashion for the interested layperson. The illustrations are particularly helpful in clarifying difficult concepts.

_______. *The Restless Universe: An Introduction to Astronomy.* Houghton Mifflin, 1978. LC# 77-78584. ISBN 0-395-25392-6. 464pp. Color and b/w photos, diagrams. Index. Glossary. Instructor's Manual available: ISBN 0-395-25393-4. Adult.

A textbook for the nonscientist in which the newly evolved concepts of recent years are explained, along with the basic astronomy of the past. The sections deal first with the fundamentals (nature of astronomy, planetary motion), then the planets, stars, galaxies, and life. Each chapter begins with a brief statement of the main ideas to be presented and ends with a summary, list of Key Concepts, review questions, and further reading suggestions. Boxes are used throughout to set off special concepts, especially mathematical ones. In addition, one of the appendixes contains fifty numerical problems.

Short, Nicholas M. *Planetary Geology.* Prentice-Hall, 1975. LC# 74-31303. ISBN 0-13-679290-1. 361pp. B/w photos and diagrams. Index. Bibliography. Adult.

A survey textbook of results from space exploration missions concerning the nature, characteristics, and suggested origins of Earth and the other planets in our solar system. Although quite technical from a geological point of view, this book requires little mathematics or physics and thus can provide for the layperson a comprehensive view of the discoveries of the space program, especially when using the explanations of the stunning photos that have derived from the space missions. Each chapter ends with review questions.

Short, Nicholas, M., et al. *Mission to Earth: Landsat Views the World.* NASA SP-360. US GPO, 1977. Stock no. 3300-00659-4. 472pp. Color photos. General.

A big atlas-type hardcover volume of 400 full-color images of locations throughout the world. The color is the fake color of the infrared bands of the spectrum (e.g., vegetation looks red). Each picture is fully captioned with features located by a number-letter grid system. Captions include recent data in geography, geology, botany, etc. Introductory pages detail the Landsat operation.

Educator's Guide for Mission Earth: Landsat Views the World, prepared by Margaret A. Tindal. NASA SP-360. US GPO, 1978. Stock no. 3300-00735-3. A teacher's resource suggesting class activities based specifically on selected images in the big book (no images are included in the Guide). Exercises apply to Earth sciences, geography, and social studies. A useful glossary of geological and remote sensing terms is included.

Shurkin, Joel N. *Jupiter—The Star that Failed.* A Franklin Institute Book. Westminster, 1979. LC# 78-10885. ISBN 0-664-32642-0. 110pp. B/w photos and diagrams. Index. Intermediate and upper.

Starting right out with the current model of the creation of the universe, called the "Big Bang," this book delves quite deeply into history pertaining to Jupiter. It looks at the successful Pioneer space probes sent to provide the first close-up look at one of the outer planets—a look that reveals the possibility of newly evolving life in the giant planet's extraordinary atmosphere.

Shuttlesworth, Dorothy E., and Lee Ann Williams. *The Moon: Stepping Stone to Outer Space.* Doubleday, 1977. LC# 76-50787. Trade ISBN 0-385-12118-0. Library binding ISBN 0-385-12119-9. B/w photos. Index. Glossary. Upper.

For all of mankind, our Moon has been the primary object of interest in the night sky, and consequently the primary target of manned space exploration. This book collects the total picture: myth and legend, technology of lunar exploration, the surface, eclipses, and tides. It looks at other natural satellites in the solar system as well as the increasing number and variety of artificial moons.

Silk, Joseph. *The Big Bang: The Creation and Evolution of the Universe.* Freeman, 1980. LC# 79-19340. Hardcover ISBN 0-7167-1084-6. Paperbound ISBN 0-7167-1085-4. 394pp. B/w photos and diagrams. Index. Glossary. Bibliography. Adult.

A solid introduction to the large structures of the universe and their evolution for the nontechnical reader or as a supplemental textbook for the student. The emphasis is on the incredible discoveries of recent years which have made cosmology a science instead of a subject of philosophical thought. An appendix provides chapter-by-chapter mathematical notes for those readers who care to go beyond the basic explanations. An extensive glossary is included.

Simon, Seymour. *The Long View into Space.* Crown, 1979. LC# 79-11388. ISBN 0-517-53659-5. 48pp. B/w photos. Primary and intermediate.

A fascinating photographic look at our universe for children, or for anyone seeking a vivid but basic introduction to the worlds beyond Earth. The text consists primarily of long captions that refer specifically to what we know through photos, making the reader a citizen of the universe.

________. *Look to the Night Sky: An Introduction to Star Watching.* Viking, 1977. LC# 77-24181. ISBN 0-670-43993-2. 87pp. B/w photos and art. Index. Bibliography. Intermediate and upper.

A straightforward introduction to constellations, their changing appearance through the year, the Moon and its phases, comets and meteors. A major portion of the book concentrates on special sky sights: eclipses, occultations, auroras, and nebulas and galaxies.

________. *Science at Work: Projects in Space Science.* Watts, 1971. LC# 80-171900. ISBN 0-531-01997-7. 87pp. B/w art by Lynn Sweat. Index. Bibliography. Intermediate and upper.

Activities for young people that demonstrate the major facets of space exploration: how we get into space, how people can exist there, and how we explore it. Each of the experiments describes the materials needed, what to do, and what to look for.

Slote, Alfred. *The Moon in Fact and Fancy.* Revised edition. Collins-World, 1971. LC# 73-144781. ISBN 0-529-01224-3. 128pp. B/w art by John Kaufmann. Index. Intermediate.

Before scientists supplied the answers to questions about the Moon, it was left to the storyteller to explain the mysteries. Folk tales from around the world serve as delightful contrast to alternating chapters which clearly explain what we know today about the Moon, as well as how we know it.

Smith, Delbert D. *Space Stations: International Law and Policy.* Westview, 1979. LC# 79-13106. ISBN 0-89158-654-7. 264pp. Index. Adult.

This author defines space station as a "man-made object or facility in outer space established with a purpose, such as to provide goods or services." It is larger than a conventional satellite but not necessarily manned; it may provide such services as communications, Earth sensing, power, manufacturing. The legal issues are many as space becomes truly a realm of Earth. Written without a great deal of legal jargon.

Smith, Harry T., and Henry J. Warden. *Industrial Arts Teachers Manual for Model Rocketry.* Estes, 1980. 32pp. B/w photos and art. Adult.

A guide for helping industrial arts teachers join the thousands of others who find model rocketry an exciting and important curricular tool. Instructions are given for the complete fabrication of model rockets.

Smith, Howard E., Jr. *Play with the Sun.* McGraw-Hill, 1975. LC# 74-26631. ISBN 0-07-059105-9. 48pp. Two-color art by Frank Bozzo. Primary.

Exploring the Sun's effect on Earth, with activities and questions that involve the child. Reflections, color, shadows, and time are among the concepts covered.

Smith, Norman F. *Moonhopping: Through Our Solar System.* Science is What and Why series. Coward McCann, 1977. LC# 76-43261. Trade ISBN 0-698-20398-4. Library binding ISBN 0-698-30643-0. 48pp. Two-color art by Bob Totten. Index. Primary.

An aerospace scientist takes primary-age readers on a jaunt through the solar system, using the perspective of the moons to look at the planets they circle, all shown in dynamic pen and ink drawings. A final note discusses the evolution of the solar system.

________. *Space: What's Out There?* What Lives There series. Coward McCann, 1976. LC# 76-4855. Trade ISBN 0-698-30585-X. Library binding ISBN 0-698-20332-1. 32pp. Two-color art by Murray Tinkelman. Primary and intermediate.

An introduction to the environment beyond our atmosphere. It is cold, there is no air, gravity is different on each planet and moon, solar winds "blow," meteors speed by, comets appear from the distance. But radio waves move freely and are being used to study the far reaches of the universe.

________. *Sun Power.* Science is What and Why series. Coward McCann, 1976. LC# 76-3493. Trade ISBN 0-398-20374-7. Library binding ISBN 0-398-30626-0. 48pp. Two-color art by Don Madden. Index. Primary.

Humorous and detailed illustrations carry along this beginner's discussion of the Sun and its value to us. It shows fossil fuel development, wind at work, water power as derived originally from the Sun, and finally, the use of more direct solar energy and the potential of nuclear fusion.

Smolders, Peter. *Soviets in Space.* Taplinger, 1974. LC# 73-16177. ISBN 0-8008-7340-8. 286pp. Color and b/w photos, diagrams. Index. Foreword by Patrick Moore. Secondary and adult.

A study of Soviet achievement in space—the launching of the first man-made object to reach the Moon; the first lunar satellite; and the first robot to bring a lunar sample back to Earth. It conveys a vivid picture of the technical difficulties that the Soviets had to surmount during their landmark flights.

Solomon, Joan. *The Structure of Space: The Growth of Man's Ideas on the Nature of Forces, Fields and Waves.* A Halsted Press Book. Wiley, 1974. LC# 73-8543. ISBN 0-470-81221-4. 219pp. B/w photos. Index. Bibliography. Secondary and adult.

An introduction to space and the laws that govern it, primarily through the stories of the development of knowledge about such subjects as gravity, magnetism, relativity, light, and electromagnetism.

Space Science Board, National Research Council. *Human Factors in Long-Duration Space Flight.* National Academy of Sciences, 1972. LC# 70-189063. ISBN 0-309-01947-8. 272pp. Bibliography. Adult.

At the request of NASA, a study was made of behavioral, psychological, physiological, and medical factors in space flights lasting up to two years. This volume indicates the areas of research to be pursued in the following years without specific reference to missions.

________. *Scientific Uses of the Space Shuttle.* National Academy of Sciences, 1974. 198pp. B/w photos. Adult.

The thoughts of a committee studying the potential uses of the Space Shuttle that arise from the system's specialness rather than from its conventional launch capabilities. Participants were involved in atmospheric and space physics, high-energy astrophysics, infrared astronomy, optical and ultraviolet astronomy, solar physics, life sciences, and planetary exploration.

________. *Strategy for Exploration of the Inner Planets.* National Academy of Sciences, 1978. 97pp. Adult.

The aims of investigating the inner planets of our solar system are described by scientific objectives instead of missions. This volume summarizes the present state of knowledge about each planet and looks to the future.

Steinberg, Florence S. *Aboard the Space Shuttle.* NASA EP-169. US GPO, 1980. Stock no. 3300-00806-6. 32pp. Color and b/w photos, two-color diagrams. Upper and up.

Other books provide the awesome technological details of the Space Shuttle as a craft. This thoroughly illustrated booklet shows what life will be like aboard the Shuttle, what it will feel like to live and work there. From personal hygiene to moving around the cabin, it answers the questions on breathing, exercise, sleeping and eating, using the Manipulator Arm. A double foldout displays the entire flight deck.

Steinhoff, Ernst A., editor. *The Eagle has Returned.* Vols. 43 and 45 in the AAS Science and Technology series. AAS, 1977. Part I ISBN 0-87703-086-3. Part II ISBN 0-87703-092-8. 794pp. total. B/w photos and diagrams. Adult.

The Dedication Conference of the International Space Hall of Fame was held at Alamagordo, New Mexico, in 1976. The two volumes are divided by times at which the papers, responses, and comments were received by the editor, not by subject, although most of the biographies of the inductees are in Part II. Subjects covered during the conference include astronautics history, engineering in spaceflight, optical and radio astronomy, life sciences, developments in space law, and space stations. The speeches given at the dedication ceremonies, special sessions, and banquets are also printed.

Stewart, J. D. *VHF Radio Propagation*. Sams, 1978. LC# 78-71888. ISBN 0-672-21575-6. 112pp. B/w diagrams. Index. Adult.

Amateur radio has entered the Space Age—not only with the OSCAR satellites but also with the use of very high frequencies for long-distance communications. The frequency range from 30 to 300 megahertz can be propagated by Earth's ionosphere, auroras, meteor trails, even the Moon, along with the OSCAR amateur radio satellites. This paperbound book for experiment-minded, advanced radio amateurs discusses all these methods and concludes with a chapter on radio astronomy projects.

Stiley, Frank. *The Search: Our Quest for Intelligent Life in Outer Space*. Putnam, 1977. LC# 76-54149. Trade ISBN 0-399-20587-X. Library binding ISBN 0-399-61076-6. 160pp. B/w photos. Index. Upper.

A study for young people of the probabilities of life elsewhere in the universe, the search for planets, the history of radio astronomy, with attention concentrated on Karl Jansky, the Bell Labs engineer who discovered radio signals from the sky. It concludes with speculation on what extraterrestrial life might be like.

Stine, G. Harry. *Handbook of Model Rocketry*. Fourth edition. Follett, 1976. LC# 75-13852. Hardcover ISBN 0-695-80616-5. Paperbound ISBN 0-695-80615-7. 352pp. B/w photos and diagrams. Index. Bibliography. Intermediate and up.

This official handbook of the National Association of Rocketry is the most comprehensive of the beginner's guides. The new edition is completely rewritten, expanded, and re-illustrated. It covers the recent developments of the rocket kit firms and carries the beginner into more advanced work with multistaging, stability calculations, recovery devices, glide recovery, and model rocket ranges.

________. *The New Rocketry Manual*. Arco, 1977. LC# 76-56137. Library binding ISBN 0-688-04282-6. Paperbound ISBN 0-668-04030-0. 123pp. B/w photos and diagrams. Index. Secondary.

A model rocketry pioneer and leader in international competition presents the basic information about building and launching model rockets. The details of constructing one of the readily available kits are presented down to the common blunders. The rocket motors are described as are all the steps in safely and successfully flying the rocket.

________. *Shuttle into Space: A Ride in America's Space Transportation System*. Follett, 1978. LC# 78-51262. ISBN 0-695-30920-X. 126pp. Color art and b/w photos. Index. Glossary. Intermediate and upper.

A first-person story of a flight aboard the Space Shuttle, with fictional characters but very real technology explained. Numerous details are incorporated into the story.

________. *The Third Industrial Revolution*. Putnam, 1975. LC# 75-21783. ISBN 0-399-11552-8. 192pp. B/w drawings. Index. Introduction by Senator Barry Goldwater. Secondary and adult.

The first industrial revolution replaced the human body with the machine. The second substituted computer feedback for mental processes. The third industrial revolution is expanding our world beyond Earth—our environment is becoming the whole solar system. This thoughtful book looks at energy, space manufacturing facilities, colonization, even re-engineering space for man's benefit.

Stoiko, Michael. *Pioneers of Rocketry*. Hawthorn, 1974. LC# 73-14229. ISBN 0-8015-5876-X. 129pp. B/w photos. Index. Introduction by Frederick C. Durant III. Upper and secondary.

Concise biographies of the five men of different nations whose work laid the foundations for spaceflight: William Congreve of England, Konstantin Tsiolkovsky of Russia, Robert Esnault-Pelterie of France, Robert Goddard of the United States, and Herman Oberth of Germany.

Stoy, R. H., editor. *Everyman's Astronomy*. St. Martin's, 1974. LC# 74-81460. ISBN 0-312-27195-6. 493pp. B/w photos and diagrams. Index. Glossary. Adult.

A collection for the layperson of eleven straightforward articles covering all facets of astronomy, going into considerable detail on history, description, and exploration of the planets, stars, galaxies, and telescopes.

Straka, W. C. *The Supernova*. NASA EP-126. US GPO, 1977. Stock no. 3300-00654-3. 48pp. B/w photos and diagrams. Glossary. Secondary and adult.

A booklet prepared for secondary school science teachers in cooperation with the American Astronomical Society. It discusses in nontechnical language the most spectacular changes in the life of a star, related objects, and their importance in astronomy. Such events may lead to such phenomena as neutron stars and black holes. The other three booklets in the group are: Blanchard, *Atoms in Astronomy;* Gammon, *Chemistry Between the Stars;* and Jacobs, *Extragalactic Astronomy*.

Strong, James. *Search the Solar System: The Role of Unmanned Interplanetary Probes*. Crane, Russak, 1973. LC# 73-80427. ISBN 0-8448-0231-1. 160pp. B/w art. Index. Bibliography. Secondary and adult.

Discusses the previous and proposed flights to Mars, Venus, the Moon, Saturn, Jupiter, and Pluto. British in origin, this interesting book gives plenty of space to proposed European programs and ideas, such as one for a "kamikaze" probe to take pictures of the Sun, or perhaps an observatory on Janus, tenth moon of Saturn.

Suares, Jean-Claude, and Richard Siegel, with text by David Owen. *Fantastic Planets.* Reed Books, 1978. LC# 78-64553. ISBN 0-89169-534-6. 160pp. Color and b/w photos and art. Upper and up.

Inhabited worlds created primarily for science fiction films are shown alongside the real worlds that man is progressively exploring. An introduction, "The Lure of Other Worlds," discusses the history of science fiction films. The Moon, Mars, the Solar System, and Beyond the Solar System are the four chapters of pictures and captions.

Sullivan, Walter. *Black Holes: The Edge of Space, the End of Time.* Anchor Press/Doubleday, 1979. LC# 78-20239. Hardcover ISBN 0-385-07156-6. Paperbound ISBN 0-446-93677-4 from Warner. 303pp. B/w photos and diagrams. Index. Secondary and adult.

Starting with the mysterious explosion in Siberia in 1908, the author leads the reader along "the route of speculation and discovery that has convinced many scientists that black holes exist and have been detected." Some very complicated evidence and reasoning is explored clearly for the curious layperson.

Summerlin, Lee B., editor. *Skylab, Classroom in Space.* NASA SP-401. US GPO, 1977. Stock no. 3300-00678-1. 192pp. Color and b/w photos. Index. Secondary and adult.

Twenty-five high school students from across the U.S. were selected in 1972 to participate in the Skylab program. They were from among the more than four thousand students who had made proposals in the Skylab Student Project originated by NASA and the National Science Teachers Association. This colorful volume presents information on how and why the project was developed, describes the experiments aboard, and relates them to scientific investigations aboard Skylab. Also detailed are a number of science demonstrations performed by astronauts to illustrate fundamental laws of physics in the weightless condition of the space station.

Swihart, Thomas L. *Journey through the Universe: An Introduction to Astronomy.* Houghton Mifflin, 1978. LC# 77-76343. ISBN 0-395-25518-X. 366pp. Color and b/w photos, diagrams. Index. Glossary. Bibliography. Instructor's Manual available: ISBN 0-395-25519-8. Adult.

An introductory textbook for nonscience majors that divides the subject into four parts: basics of energy, radiation, and astronomical instruments; the solar system; the stars, starting with our Sun; and galaxies and cosmology. Each chapter ends with a list of important words, review questions, discussion questions, and references.

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Talay, Theodore A. *Introduction to the Aerodynamics of Flight.* NASA SP-367. Available from NTIS, N76-11043. 198pp. B/w diagrams. Secondary and adult.

A textbook for beginning flight students developed from an introductory course given at the NASA Langley Research Center. It covers more technical detail than a layperson might require but less than college aerodynamics. It deals with the atmosphere of flight as well as aerodynamics of the Space Shuttle.

Talcott Mountain Science Center. *Space Science Involvement.* American Radio Relay League, 1974. 64pp. B/w diagrams. Adult.

A curriculum supplement for classroom use of an active communications satellite with activities for space science, physics, mathematics, astronomy, communications, and electronics. It brings space right into the upper elementary and high school classroom through use of the various OSCARs (Orbiting Satellites Carrying Amateur Radio).

Tanner, Dan, and George Johnson. *Cities in Space.* Harvest House, 1979. LC# 79-63817. ISBN 0-89081-186-5. 157pp. Color art, b/w photos. Secondary and adult.

A clergyman and a religious writer look from the Space Shuttle towards human colonization of space and other worlds and the possible consequences. They propose that mankind's greatest destiny will be among the stars. Science and history are mixed with religious thought and speculation.

Tattersfield, D. *Projects and Demonstrations in Astronomy.* A Halsted Press Book. Wiley, 1979. LC# 79-84264. ISBN 0-470-26715-1. 331pp. B/w photos and diagrams. Index. Secondary and adult.

A useful book, with application in many settings, that presents numerous experiments and projects that can be done indoors, when it's not possible to be observing the sky. The explanations of the activities add up to a short course in astronomy. Activities are presented on orbital motion, the Moon, celestial sphere, planets, the Sun, astronomical instruments, stars, galaxies, and nebulas. Solutions are given at the end.

Tauber, Gerald E. *Man's View of the Universe: A Pictorial History.* Crown, 1979. LC# 77-17588. ISBN 0-517-52674-3. 352pp. B/w photos and drawings. Index. Bibliography. Secondary and adult.

A thoroughly illustrated discussion of the evolving concepts of the universe, from ancient times to today's space probes. It introduces the layperson to the science and history of astronomy. The fascinating and unusual collection of illustrations will be interesting to the browser, through they are best used to augment and clarify the text.

Taylor, G. Jeffrey. *A Close Look at the Moon.* Dodd, Mead, 1980. LC# 79-24721. ISBN 0-396-7797-8. 96pp. B/w photos and art. Index. Intermediate and upper.

The space program, both manned and unmanned, has given us an incredibly close look at the Moon. This book relates the basic details about the Moon, the geologist's view of the Moon rocks, its evolution as perceived through recent discoveries, and what our knowledge of the Moon tells us about Earth.

Taylor, John G. *Black Holes: The End of the Universe?* Random House, 1973. LC# 73-20572. Hardcover ISBN 0-394-49086-X. Paperbound ISBN 0-380-39974-1 from Avon. 175pp. Secondary and adult.

A philosophical look at the black hole and implications of its existence. Attitudes toward the "turmoil" into which traditional science has been thrown are discussed. The physics of the black hole and the potential for its use as a source of energy and as a "time tube" for space travelers are described.

Taylor, L. B., Jr. *For All Mankind: America's Space Programs of the 1970s and Beyond.* Dutton, 1974. LC# 74-9109. ISBN 0-87690-115-1. 307pp. B/w photos. Index. Foreword by Wernher von Braun. Secondary and adult.

Future generations—all mankind—will reap the benefits of America's current space programs, especially the multiple benefits to be derived from communications satellites and Earth resources satellites. Taylor describes these space programs as he does the Space Shuttle, which von Braun sees as "a fundamental national resolve to effectively utilize the full potential of all types of future space activities." This book discusses that full range of possible activities and the benefits of them—both immediately practical and far-reaching scientific.

________. *Gifts from Space: How Space Technology is Improving Life on Earth.* John Day, 1977. LC# 77-3261. ISBN 0-381-90056-8. 130pp. B/w photos. Index. Bibliography. Upper and secondary.

More than just a book describing things derived from the space program, this volume delves into ways in which our lives are being substantially affected through space—industrial windfall, transportation improvement, energy exploration, worldwide communications, Weather Watch, and prospecting from space. Perhaps most important is the abundance of information already obtained that is still to be utilized.

________. *Space Shuttle.* Crowell, 1979. LC# 78-4777. ISBN 0-690-03897-6. 93pp. B/w photos and drawings. Bibliography. Upper and secondary.

The Space Shuttle takes off for Earth orbit, launching the reader on a history of how and why the American space transportation system was developed, how other nations are involved, the criticism and benefits. This author ends by describing the potential for the industrialization and colonization of space.

Thompson, Brenda, and Rosemary Giesen. *Rockets and Astronauts.* A First Fact Book. Lerner, 1977. LC# 76-22453. ISBN 0-8225-1360-9. 24pp. Color art by David Hardy and Rosemary Giesen. Primary.

The astronauts' journeys into space and to the Moon's surface are described in dramatic art and brief text. An additional section at the end shows satellites and a planetary probe, ending with a word list.

Thompson, Brenda, and Cynthia Overbeck. *Spaceship Earth.* A First Fact Book. Lerner, 1977. LC# 76-22458. ISBN 0-8225-1361-7. 24pp. Color art by David Hardy and Rosemary Giesen. Primary.

Earth is like a giant spaceship, beautiful but vulnerable to disaster. Dramatic illustrations show what Earth might be like if it stopped spinning, or if its air became totally polluted, or if similar events took place. We must take care of our spaceship. The book concludes with a word list and extra fact section on geologic eras in Earth's history.

Tindal, Margaret A. *Educator's Guide for Mission to Earth: Landsat Views the World,* see Short: *Mission to Earth.*

Tombaugh, Clyde, and Patrick Moore. *Out of the Darkness: The Planet Pluto.* Stackpole, 1980. LC# 80-36881. ISBN 0-8117-1163-3. 220pp. B/w photos. Index. Glossary. Foreword by Dr. James W. Christy. Secondary and adult..

On March 14, 1930, the headlines read, "Ninth Planet Discovered on Edge of Solar System: First Found in 84 Years." This book, by the discoverer of that planet and a noted astronomy writer, tells the detailed, fascinating story of the 25-year search leading to that headline. The Foreword is by the astronomer who, in 1978, discovered that the still-mysterious Pluto has a satellite, now named Charon. The entire book is an absorbing account of the reality behind discovery.

Tripp, Ralph H., and John K. Stotz, Jr., editors. *Space Technology Transfer to Community and Industry.* Vol. 29 in the AAS Science and Technology series. AAS, 1972. ISBN 0-87703-062-6. 185pp. Adult.

Proceedings of the Eighteenth AAS Annual Meeting and Tenth Goddard Memorial Symposium, held in 1972 in Washington, D.C. The eighteen papers presented discuss the programs that existed to speed technology transfer, give practical examples of the application of space technology to several industries and community health care, and, finally, look at the way transportation of the future may be affected by space technology.

Tross, Carl H., editor. *Export of Aerospace Technology.* Vol. 46 in the AAS Science and Technology series. AAS, 1978. ISBN 0-87703-093-6. 161pp. Bibliography. Adult.

The Fifteenth Goddard Memorial Symposium, divided into three panel discussions, is fully reported in this volume. Government policy and aerospace technology transfer, what technology is suitable for transfer, and national security implications are discussed.

________. *Future Space Activities.* Vol. 40 in the AAS Science and Technology series. AAS, 1976. ISBN 0-87703-076-6. 165pp. B/w photos and diagrams. Adult.

Proceedings of the Thirteenth Goddard Memorial Symposium, held in 1975 in Washington, D.C., presenting a broad overview of major U.S. and European space programs underway. Space Shuttle, Satellite Solar Power Station, and Advanced Mars Mission are among the projects presented.

Turner, Rufus P. *Solar Cells and Photocells.* Sams, 1975. LC# 74-33837. ISBN 0-672-21175-0. 96pp. B/w photos and diagrams. Index. Glossary. Secondary and adult.

Requiring some elementary electronics but a minimum of theory, this paperbound book for experimenters and science fair participants presents the basics of photoelectricity and describes light meters and various light-operated circuits. The glossary of optical and photoelectric terms is extensive.

Turnill, Reginald. *Space Age.* Warne, 1980. ISBN 0-7232-2408-0. 128pp. Color and b/w photos, diagrams. Index. Intermediate and upper.

Dr. Wernher von Braun told the author, "I just envy the youngsters who have a chance of going on where we leave off." This volume anticipates the next era in the Space Age, starting with the Space Shuttle, and then explains how we reached this point. One chapter is devoted to military uses of space and the conclusion looks for other beings in the universe. All of it concerns opportunities for young people.

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UNESCO. *A Guide to Satellite Communication.* No. 66 in Reports and Papers on Mass Communications. UNESCO Press, 1972. 36pp. Bibliography. Adult.

A basic guide for decision-makers worldwide concerned with communication, part of UNESCO's program to promote the use of space communication for the free flow of information, the spread of education, and greater cultural exchange. it describes the satellites' history, capability, applications, and implications.

U.S. Community Services Administration. *Solar Energy Policy.* CSA Pamphlet 6143-10. US GPO, 1979. Stock no. 0-59-000-00059-4. 48pp. B/w photos. Secondary and adult.

The federal antipoverty agency explains solar energy as "a kind of salvation" for the poor and shows examples of the way it could be used.

U.S. Department of Agriculture, Science and Education Administration. *Wind and Windmills.* Program Aid #1256. US GPO, 1980. 12pp. B/w diagrams. Secondary and adult.

Brief coverage of windmills, their costs, and their usefulness for pumping water and generating electricity.

U.S. Department of Commerce, National Oceanographic and Atmospheric Administration. *Space: Environmental Vantage Point.* US GPO, 1974. Stock no. 0317-00259. 36pp. Two-color photos and diagrams. Secondary and adult.

Describes satellite technology and the accomplishments of such meteorological satellites as TIROS, NIMBUS, TOS, and ESSA. Infrared sensing is used by the ITOS satellite when it is on the dark side of Earth and can't use normal photography. The booklet looks at environment in general, not just weather.

________. *Watch Upon a Star.* NOAA/PA77002. US GPO, 1977. 18pp. Color and b/w photos and art. Upper and secondary.

Explores NOAA's Space Environment Services Center in Boulder, Colorado, where solar activity is watched for bursts of solar wind, primarily by GOES, the Geostationary Operational Environmental Satellite, which has sensors for monitoring the Sun. The booklet explains what we know about our Sun.

U.S. Department of Energy. *Fuels and Chemicals Made from Solar Energy: Options for the 1990s and Beyond.* DOE/CS/21051-01. US GPO, 1980. 12pp. B/w photos. Secondary and adult.

Solar thermal-energy systems are described. They are used to produce temperatures as high as 2500° Fahrenheit for use in industrial processes.

U.S. Department of the Interior, Geological Survey. *Studying the Earth from Space.* US GPO, 1977. Stock no. 024-001-02987-1. 24pp. Color and b/w photos. Bibliography. Upper and up.

A new edition of a now classic pamphlet that explains the basics of remote sensing and interpretation of space data. Among the major applications of the technique are geology, geography, hydrology, marine, and land management.

U.S. Energy Research and Development Administration. *Usable Electricity from the Sun.* US GPO, 1980. Stock no. 0-60-000-00039-5. 10pp. B/w diagrams. Secondary and adult.

Solar cells, modules, and arrays are described briefly, along with prospective costs for using these photoelectrical devices as sources of electricity.

U.S. House of Representatives, Committee on Science and Technology. *Toward the Endless Frontier.* US GPO, 1980. Stock no. 052-070-05133-7. 1073pp. Secondary and adult.

A history of the House Committee that has had responsibility for decision-making regarding space, covering the years 1959 to 1979. An inside view of many of the important decisions of the space program.

U.S. Library of Congress, Science Policy Research Division. *Possibility of Intelligent Life Elsewhere in the Universe.* Revised edition. US GPO, 1977. 125pp. B/w photos and drawings. Glossary. Adult.

A report prepared for the Committee on Science and Technology of the U.S. House of Representatives presents what is known and speculated on the subject, presented in five sections: life in our solar system, the universal search, where we should look, methods of contact, and characteristics of intelligent extraterrestrial life. An appendix includes a reprint of the Smithsonian magazine article "Exotic Bestiary for Vicarious Space Voyagers," on how the display at the National Air and Space Museum was prepared.

________. *World-Wide Space Activities.* US GPO, 1977. 607pp. Adult.

Almost every nation on Earth is involved in some way in space activities, whether it be membership in the World Meteorological Organization, as a user of Landsat data, or whatever. This document lists those involvements, as well as discussing other nations' national programs, international cooperation in U.S. programs, and identification of major policy issues involving international cooperation.

U.S. National Aeronautics and Space Administration. *Aircraft Energy Efficiency, Overview.* NF-96. US GPO, 1980. Stock no. 3300-00812-1. 8pp. B/w photos and diagrams. Secondary and adult.

A NASA Facts pamphlet that describes the NASA Aircraft Energy Efficiency Program which includes six advanced technology development projects to cut fuel consumption: Engine Component Improvement, Advanced Engines, Advanced Turboprops, Composite Primary Structures, Aerodynamics and Active Controls, and Laminar Flow Control.

________. *America on Mars.* NF-75. US GPO, 1977. Stock no. 3300-00673-0. Upper and up.

A full-color NASA Facts wallsheet, measuring 31 × 48 inches, describing in pictures and text the scientific results of the Viking mission in which two dual spacecraft studied Mars in 1976. Featured are spectacular color photos taken on the surface of the Red Planet.

________. *Apollo.* EP-100. US GPO, 1974. Stock no. 3300-00553-9. 64pp. Color photos. Upper and up.

A big, full-color, paperbound book that fully illustrates and briefly describes the space-exploration background to the U.S. journeys to the Moon, starting with the Mercury program and concluding with some of the best photos from each Apollo mission.

________. *Apollo 16 at Descartes.* EP-97. US GPO, 1973. Stock no 3300-00449-4. 32pp. Color photos. Upper and up.

The flight of Apollo 16 to the Descartes region of the Moon shows how well scientists and engineers can work together to get the most out of lunar exploration. Primarily a scientific mission, Apollo 16's astronauts spent close to three days on the Moon's surface, making three lengthy excursions in the Lunar Rover.

________. *Apollo-Soyuz Test Project.* NF-51. US GPO, 1975. Stock no. 3300-00601-2. Upper and up.

A full-color, 47 × 40-inch NASA Facts wallsheet, prepared before launch. Describes the mission in which Russian and American spacecraft docked in orbit, crews visited each other's spacecraft, and a compatible space rendezvous and docking system designed for use by manned spacecraft of all nations was tested.

________. *Comparing the Planets.* NF-58. US GPO, 1979. Stock no. 3300-00744-2. Upper and up.

A colorful, 31½ × 55½-inch NASA Facts wallsheet of the solar system, introducing the concept of comparative planetology. In addition to sizes of planets and distance from the Sun, it describes the planets in terms of composition and density, atmosphere, geophysics, and geology.

Teacher's Guide for NF-58, Comparing the Planets, prepared by Robert E. Murphy. NF-109. US GPO, 1979. Stock no. 3300-00787-6. 16pp. Glossary. Adult. Explains the purpose of the wallsheet and the concerns of comparative planetology. Provides ideas for classroom use of the chart and sections about orbital and physical data, composition, origin, atmosphere, geophysics, and geology of planets, and the possibilities of life.

________. *Energy and Technology Applications.* US GPO, 1979. Stock no. 3300-00749-3. 8pp. B/w photos and art. Secondary and adult.

A brief overview of the work at the NASA Jet Propulsion Laboratory to apply space technology to solving the energy problem. Includes work in solar energy, coal technologies, geothermal generating plants, energy waste, plant energy life sources, electric and hybrid vehicles, transportation efficiency, and biomedical and environmental technology.

________. *A Forecast of Space Technology. 1980-2000.* SP-387. US GPO, 1976. Stock no. 3300-00641-1. 336pp. B/w diagrams. Adult.

A supporting volume for the main *Outlook for Space* report (see below), this book exhibits the work of the Working Group concerned with forecasting the state of technology, often as part of the feasibility assessments of other Working Groups. In essence, their forecasts clustered into three subjects: management of energy, information, and matter.

________. *Galileo to Jupiter: Probing the Planet and Mapping its Moons.* US GPO, 1979. Stock no. 3300-00763-9. 24pp. Color art. Secondary and adult.

A detailed description of Project Galileo, a program intended to use the Space Shuttle as an interplanetary launch vehicle to send a probe deep into the atmosphere of Jupiter, which is believed to be a remnant of the original material from which stars were formed. Using a gravitational assist from Mars, the probe will require a thousand days to reach Jupiter. The entire projected mission to map the moons and explore the gaseous planet is described and illustrated in a colorful style similar to that used by the sixteenth century scientist Galileo in his notebooks.

________. *High Altitude Perspective.* SP-427. US GPO, 1978. Stock no. 3300-00731-1. 36pp. Color photos and b/w diagrams. Adult.

A reminder that many important remote sensing operations can best be carried out by a high altitude aircraft instead of an orbiting satellite. This publication describes and illustrates how the U-2 and Convair 990 are being used for various mapping programs, environmental observations, and even astronomical and atmospheric studies. Meant for potential users, this booklet can serve as a supplement to Landsat information.

________. *High Energy Astronomy Observatory.* EP-167. US GPO. 1980. Stock no. 3300-00808-2. 36pp. Color and b/w photos. Secondary and adult.

The Einstein Observatory (more formally, High Energy Astronomy Observatory 2) is in orbit continually exploring the heavens for X-ray radiating objects that are not observable through Earth's atmosphere. It has already revealed the most distant galaxies and quasars. The first object seen was a suspected black hole. The X-ray images shown in this booklet are themselves stunning pictures.

________. *Images of Mars: The Viking Extended Mission.* Sp-444 (Out of Print). US GPO, 1980. 32pp. Color and b/w photos. Secondary and adult.

Picture of Mars, taken by Viking's orbiters and landers during the period from summer 1976 to late 1979. Well-written captions describe the pictures, some of which show the changes that took place on the Martian surface in front of the Lander cameras.

________. *Infrared Astronomical Satellite.* US GPO, 1979. Stock no. 3300-00750-7. 10pp. Color art. Secondary and adult.

An international program of the 1980s to map the celestial phenomena that glow in the infrared portion of the electromagnetic spectrum, the IRAS will study objects in space that have not been viewed before because most infrared radiation is absorbed by the atmosphere before it reaches Earth's surface. Of special interest is the center of the galaxies where perhaps stars are being born and which may provide clues to understanding cosmic processes.

________. *The Jupiter Pioneers.* NF-50. US GPO, 1974. Stock no. 3300-00585-7. Upper and up.

A full-color NASA Facts wallsheet describing how the Pioneer spacecraft explore Jupiter and the initial Pioneer findings and photography of the huge, gaseous planet.

________. *Landsat.* NF-80. US GPO, 1977. Stock no. 3300-00702-7. Upper and up.

A 31 × 48-inch NASA Facts wallsheet illustrating and explaining how Landsat Earth-orbiting satellites can be used for many beneficial purposes by people all over the world.

________. *Mars as Viewed by Mariner 9.* SP-329. US GPO, 1976. Stock no. 3300-00645-4. 225pp. B/w photos. Secondary and adult.

A "picture book" of Mars as seen through the cameras of Mariner 9 space probe. Several hundred well-captioned illustrations identify surface features such as craters, volcanoes, canyons, dunes, and ice caps. In addition, photos of cloud formations and dust storms are analyzed.

________. *The Martian Landscape.* SP-425. US GPO, 1978. Stock no. 3300-00746-7. LC# 78-606041. 160pp. Color and b/w photos. Secondary and adult.

This volume, created by the Viking Lander Imaging Team, begins with "An Anecdotal Account" of the Viking photo investigation of Mars. It describes the initial planning, moves to the craft's landing on Mars on July 20, 1976, and then delves into the detailed investigations of the variety of surface materials. It also deals with such special efforts as searching for movement, providing correct color, and obtaining the third dimension. Over 200 photos of the Martian surface are included.

________. *NASA and Energy.* US GPO, 1978. Stock no. 3300-00734-5. 20pp. B/w photos. Upper and up.

A pamphlet with recent information on NASA's energy-related research projects in support of the Department of Energy and growing out of its own research: windmills and photovoltaic solar cells to produce electricity, direct solar heating and cooling, advanced ground propulsion, energy storage, cogeneration systems, and coal extraction.

________. *NASA Tech House.* EP-149. US GPO, 1977. Stock no. 3300-00704-3. 20pp. Color and b/w diagrams. Secondary and adult.

Describes a functional, 1,500-square-foot house, designed and built at NASA's Langley Research Center. It demonstrates, in a cooperative venture with other federal agencies, the new technologies available to home-builders. In particular it shows the nature and amount of energy savings achieved by using the latest aerospace-developed technology. In addition to energy savings, water conservation, safety, and security are also enhanced.

________. *New Horizons.* EP-117. US GPO, 1977. Stock no. 3300-00697-7. 40pp. Color and b/w photos and diagrams. Upper and up.

This overview of on-going NASA programs in recent years calls attention to the shift of emphasis in aeronautical research and space exploration. NASA's contributions to the solution of pressing national problems are described and illustrated. Energy, weather, communications, oceanography, medicine, mineral prospecting, Viking, Mariner, and Pioneer are among the topics covered.

________. *Observing Earth from Skylab.* NF-56. US GPO, 1975. Stock no. 3300-00627-6. 16pp. Color photos and b/w diagrams. Upper and up.

Explains and describes remote sensing of Earth from space, how data are being used, sensors, analyses of data from Earth surveys, and how to obtain data. A fold-out map in this NASA Facts booklet shows the Skylab passes on which Earth resources investigations were carried out.

________. *On the Moon with Apollo 17.* NASA EP-101. US GPO, 1972. Stock no. 3300-00470-2. 120pp. B/w photos and art. Upper and up.

A guidebook for the mission that took the Apollo 17 astronauts to the Taurus-Littrow region of the Moon. This was the last Apollo lunar mission.

________. *Outlook for Space: Report to the NASA Administrator by the Outlook for Space Study Group.* SP-386. US GPO, 1976. Stock no. 3300-00640-3. 372pp. B/w diagrams. Bibliography. Adult.

The report of a NASA-wide study group commissioned to identify and examine the various possibilities of the civilian space program for the periods 1980-2000. They screened various potential space activities against two prime criteria: "why should it be done and to what will it contribute". The major chapter on potential future space activities deals with twelve important themes: 1) production and management of food and forestry resources; 2) prediction and protection of the environment; 3) protection of life and property; 4) energy and mineral exploration; 5) transfer of information; 6) use of environment of space for scientific and commercial purposes; 7) Earth science. Five further themes related to extraterrestrial activities in response to intellectual human needs: 8) the nature of the universe; 9) origins and fate of matter; 10) life cycle of the Sun and stars; 11) evolution of the solar system; and 12) origins and future of life.

________. *Pioneer Saturn Encounter.* US GPO, 1979. Stock no. 3300-00774-4. 28pp. Color and b/w photos. Secondary and adult.

Early results and background of the flight of Pioneer Saturn (called Pioneer 11 until it swung by Jupiter on its way to Saturn). The first spacecraft to near the ringed planet and photograph Titan, its largest moon, its cameras and other instruments made major discoveries on its 1979 passage by the planet, including the presence of unseen rings, bands of atmospheric color, new moons, a large magnetic field, and an internal heat source.

________. *The Planet Venus.* NF-86. US GPO, 1978. Stock no. 3300-00714-1. 8pp. B/w photos and diagrams. Upper and up.

A NASA Facts booklet about Venus describes the surface, atmosphere, and other characteristics. Student projects and a bibliography are included.

________. *Progress in Aircraft Design since 1903.* US GPO, 1974. Stock no. 3300-00587-3. 96pp. B/w photos and art. Upper and up.

From the Wright Flyer on page 4 to the supersonic F-15 on page 93, the booklet traces the dramatic changes in aircraft design and technology with words and photos of ninety famous aircraft. The criterion for selection was that each plane be of significance for one of the following reasons: it was innovative in either design or operational use; the best example of a specific design philosophy; typical of a much-used aircraft type; or performed an outstanding feat. Statistics accompany the descriptive text on each aircraft.

________. *Resourceful Decisions: Landsat in Michigan.* US GPO, 1979. Stock no. 3300-00751-3. 28pp. Photos and diagrams. Secondary and adult.

Tells of the growing use in Michigan and elsewhere of Landsat images in checking pollution, land use and mapping, water and mineral resources, agriculture, and forestry. Discusses briefly the Earth observations work by Michigan's universities, state commissions, environmental consultants, and research institutes.

________. *Seasat A: Oceanography Today.* US GPO, 1978. Stock no. 3300-00727-2. 12pp. Color art. Upper and up.

Seasat A was the first spacecraft dedicated to exploring our oceans and the weather they generate. At the time it was in orbit, a laboratory ship was collecting the same information in order to verify the accuracy of oceanic remote sensing. This pamphlet describes the mission that could benefit mining, fishing, meteorology, ocean safety, and more.

________. *Skylab and the Sun.* EP-119. US GPO, 1973. Stock no. 3300-00533-4. 56pp. B/w photos. Secondary and adult.

Leading scientists and experts on solar physics are contributors to this readable book describing the Sun, the Skylab space station solar experiments, and what mankind stands to gain from the Skylab experience. An appendix itemizes the numerous Sun-related experiments.

_______. *Skylab EREP Investigations Summary.* SP-399. US GPO, 1978. Stock no. 3300-00741-8. 396pp. Color and b/w photos. Adult.

The Earth Resources Experiment Package (EREP) was of major importance to the work during all three Skylab missions. EREP carried sensors that recorded data in the visible, infrared, and microwave spectral regions, usually operated by astronauts instead of automatically. The data acquired were used by 139 investigators in five major areas: land use and cartography, agriculture, range, and forestry; geology and hydrology; oceans and atmosphere; and finally, the techniques of data analysis itself. This semi-technical book is heavily illustrated.

_______. *Skylab Experiments.* EP-110-116. US GPO, 1973. Secondary and adult.

A series of seven paperbound books developed to bypass the delay time that occurs between a scientific program and the incorporation of its major findings into textbooks. Produced by the Skylab Program's scientists and NASA's Educational Programs Division in cooperation with the University of Colorado, the books provide a wide range of information for secondary teachers. Concepts for classroom activities have been included that use specific elements of Skylab science as focal points for the increased understanding of selected subjects in high school curricula. Each volume includes a glossary and most have a bibliography.

Vol. 1: Physical Science, Solar Astronomy. EP-110 (Out of Print). 92pp. B/w photos and diagrams. Glossary. Bibliography. Includes: 1) The Sun; 2) Hydrogen-Alpha Telescopes, to reveal features of the Sun's chromosphere; 3) White Light Coronagraph, for long-term observations of coronal changes with sunspot activity and solar magnetic fields; and 4) instruments to study solar activity in the ultraviolet, extreme ultraviolet, X-ray, and X-ray ultraviolet ranges.

Vol. 2: Remote Sensing of Earth Resources. EP-111. Stock no. 3300-00512-1. 116pp. B/w photos and diagrams. Glossary. Bibliography. All major aspects of remote sensing are covered. Descriptions of individual Earth resources sensors and experiments include multispectral scanners and cameras, infrared spectrometer, and microwave radiometers.

Vol. 3: Materials Science. EP-112. Stock no. 3300-00528-8. 72pp. B/w diagrams. Glossary. Bibliography. Investigations dealing with the effects of weightlessness on melting and resolidification of metal alloys and semiconductor crystals and the combustion of flammable materials are described and related to classroom subjects.

Vol. 4: Life Sciences. EP-113 (Out of Print). 118pp. B/w diagrams. Glossary. Covers a wide spectrum of studies pertaining to mineral and hormonal balance during spaceflight; hematology and immunology; and biology.

Vol. 5: Astronomy and Space Physics. EP-114 (Out of Print). 74pp. B/w photos and diagrams. Glossary. Stellar and galactic astronomy, including the mysteries of pulsars and quasars, are coupled with other categories of space research, such as phenomena within the solar system and the analysis of near-Earth space. Classroom activities are integrated into the text.

Vol. 6: Mechanics. EP-115. Stock no. 3300-00530-0. 40pp. B/w diagrams. Bibliography. Methods of dealing with two operational spaceflight problems: providing mobility for astronauts and measuring weight, or mass, in a weightless environment. They call for unconventional techniques and hardware.

Vol. 7: Living and Working in Space. EP-116 (Out of Print). 48pp. B/w diagrams. Data are gathered and documented concerning astronaut ability to perform work in long-duration weightlessness and on the habitability features of crew quarters and work stations. An experiment not related to human engineering involved web formation by a spider without the normal benefit of gravity.

_______. *Skylab Explores the Earth.* SP-380. US GPO, 1977. Stock no. 3300-00674-8. LC# 77-829. 536pp. Color photos, b/w diagrams. Glossary. Secondary and adult.

From November 16, 1973, to February 8, 1974, the crew of Skylab 4 played a major part in determining the role of man in observing Earth from space. It became clear that an amazing amount could be learned from only a few hours of concentrated observation. The Skylab cameras were trained, and scientific analyzes completed, on such natural phenomena as meso-scale cloud features, desert sand seas, floating ice, global tectonics, and vegetation patterns.

_______. *The Solar System.* US GPO, 1979. Stock no. 3300-00760-4. Intermediate and up.

A small full-color picture of the solar system as seen from the Moon, looking toward Earth. Relative sizes and distance from the Sun are shown for each planet, its orbit sketched, and a brief explanation is given of it all on the back.

_______. *Space Shuttle.* NF-79. US GPO, 1977. Stock no. 3300-00679-9. 8pp. B/w art. Upper and up.

This NASA Facts booklet provides a basic introduction with large illustrations to the operation and uses of the Shuttle, which will transport people, equipment, and other spacecraft between Earth and Earth orbit.

_______. *Space Shuttle.* NF-81. US GPO, 1979. Stock no. 3300-00743-4. Intermediate and up.

A full-color NASA Facts wallsheet showing a huge cutaway of the Space Shuttle, with small, subsidiary pictures detailing its launch and potential tasks in space.

________. *The Space Telescope.* SP-392. US GPO, 1976. Stock no. 3300-00644-6. LC# 76-7920. 244pp. B/w photos and art. Adult.

A collection of summaries by the authors of papers on the Space Telescope that were presented at the Twenty-first Annual Meeting of the American Astronautical Society held in 1975 in Denver. Initial papers describe the benefits to derive from a telescope operating above Earth's atmosphere (positioned by the Space Shuttle), the requirements of such a system, including the need for precise acquisition by remote control of the objects to be observed. Other sections of the paperbound volume introduce in semi-technical detail mission analysis and operations, telescope performance, instrument and detector development, mirror development, precision pointing and control systems, data management, and maintenance operations.

________. *This is NASA.* EP-155. US GPO, 1979. Stock no. 3300-00773-6. 48pp. B/w photos and diagrams. Index as table of contents. Upper and up.

A guided tour of the governmental body called the National Aeronautics and Space Administration, its program offices and eleven centers and laboratories. Tourist information is given for each center. A brief history of the major areas of NASA involvement is described and frequently asked questions about space are answered. A concluding section gives sources of further information on aerospace-related careers.

________. *Viking 1, Early Results.* SP-408. US GPO, 1976. Stock no. 3300-00675-6. 76pp. B/w photos and diagrams. Adult.

A report of the first twenty-four days of the Viking 1 Lander on Mars in 1976, from the first photo of the craft's own footpad to the early confusing results of the search-for-life experiments. Further analysis would require time and debate.

________. *Viking Orbiter Views of Mars.* SP-441. US GPO, 1980. Stock no. 3300-00795-7. LC# 80-600167. 192pp. Color and b/w photos. Secondary and adult.

The desolate, rocky world of our neighbor Mars has now been photographed both from the surface and from the two orbiting craft that circled the planet for many months. This volume shows and explains the major finds: the great equatorial canyons, channels, volcanoes, craters, moon details, and the polar regions.

________. *Viking Project: Mission to Mars—The Color of Mars.* US GPO, 1977. Stock no. 3300-00666-7. 14pp. Color photos. Secondary and adult.

A special issue of the *Viking Project Bulletin* presents the most startling immediate discovery of the Viking mission: Mars is indeed red. This small pamphlet with several fold-out pages separates myth from new reality, explaining the photographic system used by Viking and the importance of color in geology.

________. *Voyager—Journey to the Outer Planets.* US GPO, 1977. Stock no. 3300-00705-1. 16pp. Color art. Upper and up.

A colorful advance look at the Voyager project, in which two interplanetary probes look at Jupiter and Saturn, and possibly give us a first close look at Uranus. The two craft, launched in 1977 are described, as is what was known about the outer planets.

________. *Voyager—Journey to the Outer Planets.* US GPO, 1979. Stock no. 3300-00752-3. 12pp. Color photos and art. Upper and up.

A brief but beautiful pamphlet of new photos of Jupiter and Saturn, along with artwork of Voyager's fly-by of the planets. A chart lays out the scientific investigations, and a diagram identifies the major parts of the two giant planets.

________. *Voyager: Mission to the Outer Planets.* NF-87. US GPO, 1977. Stock no. 3300-00694-6. 12pp. B/w diagrams. Upper and up.

A pre-mission NASA Facts booklet covering all aspects of the Voyager mission to Jupiter and Saturn, launched in 1977.

________. *Voyager Encounters Jupiter.* US GPO, 1979. Stock no. 3300-00772-8. 40pp. Color and b/w photos. Secondary and adult.

In 1979 Voyagers 1 and 2 flew by the giant planet and its moons, four months apart, and then went on their way to Saturn. This heavily illustrated booklet presents some of the early photos and findings of the Jupiter encounter. The most stunning discoveries were that Jupiter, like Saturn, has rings around it, and that the Jovian satellite Io has huge active volcanoes.

________. *The Voyager Mission: Jupiter, The Giant of the Solar System.* NF-89. US GPO, 1979. Stock no. 3300-00753-1. 8pp. B/w photos and drawings. Upper and up.

A pre-mission NASA Facts booklet describing what was known about the first target of the Voyagers' journeys, what was discovered from Earth, and the importance of Jupiter's powerful magnetosphere. Student projects and a bibliography are included.

________. *Voyager 1 Encounters Saturn.* US GPO, 1980. Stock no. 3300-00817-1. 40pp. Full-color and b/w photos and art. Secondary and adult.

A photographic guidebook to the 1980 investigation of the most beautiful planet in our solar system, during which we learned more in one week than in all of recorded history. The ring structure was seen to be more complex than imagined. The numerous satellites were seen to be cratered bodies with characters all their own, especially the giant Titan, which has a shrouding atmosphere. The existence of six tiny new moons was confirmed.

________. *Voyager to Saturn.* NF-100. US GPO, 1980. Stock no. 3300-00811-2. 12pp. B/w photos and art. Upper and up.

On November 12, 1980, the first of two Voyager spacecraft made a close approach to the ringed planet, Saturn. They had already made flybys of Jupiter and were taking advantage of a planetary alignment to jump to the far reaches of the solar system. This NASA Facts booklet describes the spacecraft, what was previously known about Saturn, and the information returned by Voyager.

________. *Why Survey from Space?* NF-57. US GPO, 1975. Stock no. 3300-00619-5. 12pp. Color and b/w photos, diagrams. Upper and up.

Describes how Earth surveys are conducted from orbiting spacecraft. Among the topics discussed are making ground-based surveys, photographic surveys including stereo and effects of lights, importance of timing in surveys, and how satellite photographic surveys of Earth may be obtained. Several activities for experiencing survey techniques are included in the text of this NASA Facts booklet.

________. *The World of Tomorrow.* NASA EP-144. US GPO, 1979. Stock no. 3300-00745-1. 72pp. Color photos and line drawings. Adult.

The report of a nationwide Aerospace Activities Project, carried out by the Cub Scouts, with Edmond T. Hesser as Project Director. The first part gives eleven accounts of the project by den leaders from across the country, showing ideas for models, puppetry, moviemaking, and model rocketry. The second section shows the work of the winners in the national space contest: pictures, compositions, and models.

U.S. Naval Institute. *Space Atlas.* No. 1447. American Map Co., 1972. ISBN 0-8416-1447-4. 48pp. B/w photos and diagrams. Secondary and adult.

A small book divided into short sections easily distinguished by their bold headings. It describes the solar system, our Moon, Earth in space, and man's exploration of space. It ends with large artwork of the Space Shuttle at work.

Utgard, Russell, O., George T. Ladd, and Hans O. Andersen. *Sourcebook for Earth Sciences and Astronomy.* Macmillan, 1972. LC# 79-176061. 298pp. Adult.

A guide to science teaching materials in astronomy, meteorology, oceanography, historical geology, and physical geology, including classroom activities, relevant films and filmstrips, and additional reading suggestions.

V

Van Nuss, Wayne D., and William W. Heusner. *Space Flight Research Relevant to Health, Physical Education, and Recreation with Particular Reference to Skylab's Life Science Experiments.* NASA EP-148. US GPO, 1979. Stock no. 3300-00778-7. 60pp. B/w photos and diagrams. Index. Glossary. Adult.

Introduces to the professions of health, physical education, and recreation the space program, its general societal significance, and in particular its research relevant to the health-related education fields, particularly that deriving from the long-duration stays of astronauts aboard Skylab.

Van Patten, Richard A., Paul Siegler, and E. V. B. Stearns, editors. *The Industrialization of Space.* Vol. 36, Parts I and II, of the AAS Advances in the Astronautical Sciences series. AAS, 1978. LC# 57-43769. Part I ISBN 0-87703-094-4. Part II ISBN 0-87703-095-2. 1121pp. total. B/w photos and diagrams. Adult.

Proceedings of the Twenty-third AAS Annual Meeting held in 1977 at San Francisco. The keynote speaker observed, "The prologue is over. We are ready for the real, routine work of space." The numerous papers presented here, in full or abstracted, deal with the many aspects of that "routine work," the industrial utilization of near space. They are divided into a number of topics: large space structures, advanced transportation systems, making industrialization work, communications and navigation, space habitation, economic realities, psycho-social and biological considerations, space law, space community planning, and historical precursors.

Verschuur, Gerrit L. *Cosmic Catastrophes.* Addison-Wesley, 1978. LC# 77-92164. Hardcover ISBN 0-201-08098-2. Paperbound ISBN 0-201-08099-0. 214pp. B/w photos and art. Index. Introduction by Ben Bova. Upper and secondary.

"Cosmic catastrophes" on our Earth can occur and are occurring, according to this author, who combines science fiction and fact. He describes catastrophes as events in the universe that could destroy our planet . . . in a billion years? . . . or a thousand years? . . . or perhaps tomorrow.

________. *The Invisible Universe: The Story of Radio Astronomy.* Vol. 20 in Heidelberg Science Library. Springer-Verlag, 1974. LC# 73-22202. ISBN 0-387-90078-0. 173pp. B/w photos and diagrams. Index. Secondary and adult.

An entertaining, informal, paperbound presentation of how radio astronomy works and the discoveries that have been made in recent years, leading to the major research questions for astronomy.

________. *Starscapes: Topics in Astronomy.* Little, Brown, 1977. LC# 76-49411. ISBN 0-316-90030-3. 202pp. Glossary. Secondary and adult.

A paperbound collection of essays, most of which appeared originally in *Astronomy Magazine*, detailing in popular fashion the discoveries of recent years about our universe. The twenty-seven essays are collected in eight sections: The Solar System, Other Eyes, Interstellar Space, Stars, The Death of Stars, Galaxies, Quasars and the Universe, and Life in Space.

Vladimirov, Leonid. *The Russian Space Bluff: The Inside Story of the Soviet Drive to the Moon.* Dial Press, 1973. LC# 72-11523. ISBN 0-8037-7539-3. 190pp. Index. Foreword by Anatoli Fedoseyev. Adult.

The author contends that all science is handled in the Soviet Union not for knowledge but for power. An engineer-journalist, he tells the story of what went on behind the news from 1960 to 1966. The foreword is by a Soviet radar expert who defected to the West.

Von Braun, Wernher, and Frederick I. Ordway III. *History of Rocketry and Space Travel.* Third edition. Crowell, 1975. LC# 74-13813. ISBN 0-690-00588-1. 308pp. Color and b/w photos, art by Harry H-K Lange. Index. Bibliography. Introduction by Frederick C. Durant III. Upper and up.

By now a classic for the public, this complete story of space from the earliest experiments with rocketry is by the man most responsible for America's modern rockets and a colleague of his at Huntsville, Alabama. This large book is fully illustrated with both American and Soviet pictures. The details of most space programs, both descriptive and in tables, are sufficient to make this a basic reference work as well as a read-through book. The large chapter-by-chapter bibliography is a good reference for the entire history of the subject.

________. *New Worlds: Discoveries from Outer Space.* Anchor Press/Doubleday, 1979. LC# 78-55854. ISBN 0-385-14065-7. 284pp. Color photos. Index. Upper and secondary.

With the Viking missions, the entire solar system seemed to shrink, much as our conception of the Moon changed with the Apollo flights. Now, we are beginning to understand what kind of soil would produce Mars' red glow, why Saturn has rings, and what causes Jupiter's great Red Spot. This is a fully illustrated coverage of all the newest information from space.

________. *The Rockets' Red Glare: An Illustrated History of Rocketry through the Ages.* Anchor Press/Doubleday, 1976. LC# 75-6162. ISBN 0-385-07847-1. 212pp. Color and b/w photos. Index. Bibliography. Secondary and adult.

A history of rocketry by two people intimately involved. Unlike most books on the subject, the bulk of this volume deals with the pre-Sputnik development from ancient Asia, to Europe, and finally to America.

Von Ditfurth, Homiar. *Children of the Universe: The Tale of Our Existence.* Atheneum, 1974. LC# 73-91629. Hardcover ISBN 0-689-10588-6. Paperbound ISBN 0-689-70529-8. 301pp. B/w photos. Index. Secondary and adult.

A readable exposition of mankind's self and self-image in the universe and all the factors in the universe as well as in the Earth beneath our feet that affect us. He describes the burgeoning belief that we are not alone and, in effect, makes the reader understand that it is, truly, *our* universe.

Von Puttkamer, Jesco, and Thomas J. McCullough, editors. *Space for Mankind's Benefit.* NASA SP-313. US GPO, 1972. Stock no. 3300-00467-2. 488pp. B/w photos and diagrams. Adult.

A comprehensive study of the numerous ways in which space is of benefit to man, based on a congress held in 1971 in Huntsville, Alabama. Intended for nontechnical audiences, the forty-six presentations by experts from all over the world dealt with the impact of space on environmental protection, Earth resources, information, natural science, manufacturing, energy, societal functions, and the human spirit.

W

Wagner, Richard. *Space Shuttles to Color, Cut Out and Fly.* Price/Stern/Sloan, 1979. ISBN 0-8431-0651-4. 48pp. B/w art. Primary, intermediate, and upper.

A handy way of modeling the *Enterprise* and *Columbia* Space Shuttles in various configurations. The *Columbia* model incorporates the silver paper cover of the book.

Wald, Robert M. *Space, Time and Gravity: The Theory of the Big Bang and Black Holes.* U. of Chicago, 1977. LC# 77-4038. ISBN 0-226-87030-8. 131pp. B/w photos and diagrams. Index. Adult.

Starting with common experience, this technical but readable book describes the current ideas of space, time, and gravitation. It looks at the implications for other ideas about the origin of the universe and discusses gravitational collapse and black holes.

Walker, Jearl. *The Flying Circus of Physics.* Wiley, 1975. LC# 75-5670. ISBN 0-471-91808-3. 224pp. B/w drawings. Index. Bibliography. Secondary and adult.

An "offbeat" collection of problems and questions that are intended for fun, to make the reader (and ponderer) begin to look at the world in a new way. While most of the problems deal with purely earthbound subjects, some deal with astronomy, meteorology, and other aerospace subjects. At the end of each problem are numbers referring to an extensive bibliography in which the answers may be found. However, another version of the book containing the answers is available: *The Flying Circus of Physics with Answers,* ISBN 0-471-02984-X.

Washburn, Mark. *Mars at Last!* Putnam, 1977. LC# 77-8509. ISBN 0-399-11935-3. 291pp. B/w photos. Index. Secondary and adult.

A thorough look at the Red Planet from its earliest observation to the Viking landing. Includes the Mars of science fiction writers, their realisms and fantasies. "Mars has always been much more than just the next planet out from the sun. Mars is the place where dreams and realities meet."

Weinberg, Steven. *The First Three Minutes: A Modern View of the Origin of the Universe.* Basic Books, 1976. LC# 76-7682. ISBN 0-465-02435-1. 188pp. B/w photos. Index. Glossary. Bibliography. Adult.

A theoretical physicist explains Genesis for the layperson in an authoritative presentation of what is now believed to have happened during the explosive first three minutes of the universe. Using a "stop action" technique, the author clarifies the now-standard model of an explosion of all space, with incredible heat and light. Then, as the temperature cooled (relatively speaking), the heavier nuclei were able to form and the materials of the stars began their life.

Westman, Paul. *Alan Shepard: First American in Space.* Taking Part series. Dillon, 1980. LC# 79-19866. ISBN 0-87518-184-8. 48pp. B/w photos and two-color art. Primary and intermediate.

The first American to fly in space traveled only fifteen minutes in a trajectory arcing out into the Atlantic from Cape Canaveral. But he opened up the way for the Mercury program. And almost ten years later, the same astronaut, Alan Shepard, went into space again, this time to the Moon.

_______. *John Glenn: Around the World in 90 Minutes.* Taking Part series. Dillon, 1980. LC# 79-19515. ISBN 0-87518-186-4. 48pp. B/w photos and two-color art. Primary and intermediate.

A short biography of the boy who went from Ohio to fighter pilot action in Korea to become the first American to orbit the Earth. Later, that route led him to the United States Senate.

_______. *Neil Armstrong: Space Pioneer.* The Achievers series. Lerner, 1980. LC# 80-10832. ISBN 0-8225-0479-0. 64pp. B/w photos. Intermediate.

A biography of the first man to walk on the Moon. As a boy, he was an avid airplane modeler and his enthusiasm gained him a pilot's license before he could drive a car. The book details for young readers the astronaut's military career, space training, Gemini 8 flight, and finally, Apollo 11 to the Moon.

Wetterer, Margaret K. *The Moons of Jupiter.* Simon & Schuster, 1971. LC# 76-163493. ISBN 0-671-65179-X. 96pp. B/w photos and drawings. Index. Upper and secondary.

When it was still thought that there were only twelve moons in orbit around Jupiter, the author used them, first, to describe the excitement of scientific discovery, and then, to show how they were used to learn more about our own world. In conclusion, she explains the possibility of some of Jupiter's moons becoming space stations.

Wheat, Janis Knudsen. *Let's Go to the Moon.* Books for Young Explorers. National Geographic, 1977. LC# 77-76972. ISBN 0-87044-244-9. 32pp. Color photos. Primary.

One of a four-volume set, this exciting picture book takes young readers along to the Moon on a composite of all Apollo flights. Color diagrams placed adjacent to many photos explain just what is shown.

White, William J. *Airships for the Future.* Revised edition. Sterling, 1978. LC# 76-19768. Trade ISBN 0-8069-0093-3. Library binding ISBN 0-8069-0091-1. 160pp. B/w photos and diagrams. Index. Glossary. Upper and up.

The airship story did not end in 1937 with the destruction of the *Hindenburg,* although that story is told well here and with many pictures. Now transportation experts, engineeers, and enthusiasts, often from aerospace companies, are working to bring back airships in new and useful forms, operating less expensively, more quietly, and with greater load-carrying capacity than many vehicles required now for similar tasks.

Wicks, Keith. *Stars and Planets.* Modern Knowledge Library. Warwick, 1977. LC# 76-45483. Trade ISBN 0-531-09077-9. Library binding ISBN 0-531-09052-3. 44pp. Color photos and art. Index. Glossary. Intermediate and upper.

This well-illustrated picture of our universe shows how we have gradually learned about it and will continue to explore it with space technology. What we know about the stars, our solar system, planets, satellites, and other orbiting "bits" are described. The combination of photos and full-color art conveys much of the beauty of our universe.

Williams, J. Richard. *Solar Energy: Technology and Applications.* Revised edition. Ann Arbor Science, 1977. LC# 77-73635. Hardcover ISBN 0-250-40167-3. Paperbound ISBN 0-250-40194-0. 184pp. B/w photos, two-color diagrams. Index. Glossary. Bibliography. Adult.

Both a practical how-to book and a state-of-the-art description, this volume deals with solar energy as the only inexhaustible, pollution-free energy resource. It provides the information needed to build a solar heating and domestic hot water system and also covers other forms of solar energy—ocean thermal and wind.

Williams, Richard S., Jr., and William D. Carter, editors. *ERTS-1, New Window on Our Planet.* Geological Survey Professional Paper 929. US GPO, 1976. Stock no. 024-001-02757-7. 280pp. Color photos. Adult.

A large book of color-illustrated studies based on images from Landsat (originally called ERTS: Earth Resources Technology Satellite) in cartography, geology, and applications to water resources, land-use planning, agriculture, forestry, environmental monitoring, conservation, and oceanography.

Williams, Robert H., editor. *Toward a Solar Civilization.* MIT Press, 1978. LC# 78-16567. Hardcover ISBN 0-262-23089-5. Paperbound ISBN 0-262-73054-5. 252pp. B/w photos and drawings. Adult.

A collected series of articles prepared for the *Bulletin of the Atomic Scientists* by solar energy specialists and policy analysts. While some are technical in nature, many are philosophical, and all convey the idea that a civilization powered by solar energy would have a rich variety of technologies.

Wolfe, Tom. *The Right Stuff.* Farrar, Straus, 1979. LC# 79-13901. Hardcover ISBN 0-374-25032-4. Paperbound ISBN 0-553-13828-6 from Bantam. 436pp. Secondary and adult.

It is the inner life of early astronauts—Alan Shepard, John Glenn, and Gus Grissom among them—Wolfe describes with almost uncanny empathetic powers. These were men who competed with other ambitious pilots to ascend a pyramid that Wolfe brings to light: a pyramid of the "right stuff." He presents the astronauts at every turn as full-blooded human beings, with moments of grandeur as well as of weakness.

Wood, John A. *The Solar System.* Foundations of Earth Science series. Prentice-Hall, 1979. LC# 78-8923. Hardcover ISBN 0-13-822007-7. Paperbound ISBN 0-13-822015-8. 196pp. B/w photos and diagrams. Index. Glossary. Bibliography. Adult.

A view of our solar system as a whole. Instead of treating the planets separately, the unity and diversity of the system are explained under such subjects as motions of the planets, surfaces, interiors and atmospheres, and origin. In addition, rock samples from space are explained as is our solar system's relation to the Sun and other stars. While the geology in particular gets fairly technical, the book provides an interested layperson with a solid overview of the new knowledge about our planetary system.

Wood, John A., editor. *The Science of Astronomy.* Harper & Row, 1974. LC# 73-10684. ISBN 0-06-041446-4. 466pp. B/w photos, two-color diagrams. Index. Glossary. Adult.

A short introductory course for nonscience majors with a goal that the student should acquire "an intuitive feel for the subject and be able to understand the importance of scientific probing of the solar system and the universe." Chapters end with questions keyed to location of answers. Appendixes give star tables and maps.

Woodburn, John H. *Energy.* Merit Badge Pamphlet #3335. Boy Scouts, 1978. LC# 19-600. ISBN 0-8395-3335-7. 64pp. B/w photos and diagrams. Glossary. Bibliography. Upper and secondary.

Starting with building a solar energy box, this Boy Scout pamphlet leads the badge-seeker to what energy is and the role it plays in our lives. Energy sources are described, measurements shown, and consumption and conservation discussed. It sets the boy to measuring energy use in his own home.

Woodward, Herbert N. *The Human Dilemma.* Brookdale Press, 1971, LC# 72-17294. ISBN 0-912650-00-1. 254pp. Bibliography. Adult.

This author believes that we must colonize space if we are to survive, that our biological and technological history have led us inexorably into a trap. He carries the reader on a philosophical journey to a planet orbiting the star Tau Ceti, 12.2 light years from Earth, where humans might continue to evolve instead of being the end product of earth-bound evolution.

Worden, Alfred M. *Hello Earth: Greetings from Endeavor.* Nash, 1974. LC# 73-92966. ISBN 0-8402-1343-3. 80pp. B/w photos. Upper and up.

A collection of poems by astronaut Al Worden, Command Module Pilot for Apollo 15, in which he reveals how the profound experience of viewing Earth from two hundred thousand miles away changed his attitudes and opinions about life on Earth. He saw himself reborn during his sixty-seven hours of complete solitude in space. The poems are enhanced by unusual photos he took while on the mission.

________. *I Want to Known about Flight to the Moon.* I Want to Know About series. Doubleday, 1974. LC# 73-21878. Trade ISBN 0-385-04682-0. Library binding ISBN 0-385-05837-3. 64pp. B/w photos. Index. Introduction by Fred Rogers of "Mr. Rogers' Neighborhood." Primary and intermediate.

Written specifically to answer the questions of children, this book starts with Worden's personal story ("How did you get to be an astronaut?"). He describes the intimate details of living in close quarters in space, how they learned what it was necessary to know, what weightlessness feels like and, yes, he would go back if given the chance.

World Meteorological Organization. *One Hundred Years of International Co-operation in Meteorology.* #345 WMO. Unipub, 1973. 60pp. B/w photos. Adult.

A brief, illustrated review of the achievements of the one hundred years since the first International Meteorological Congress in 1873. The largest chapter covers the years 1963 to 1973, called the electronic revolution, when satellites began to play a vital role.

Y

Young, Louise B. *Earth's Aura.* Knopf, 1977. LC# 77-74988. Hardcover ISBN 0-394-40227-8. Paperbound ISBN 0-380-44230-2 from Avon. 306pp. Color photos. Index. Bibliography. Secondary and adult.

A grand tour of Earth's atmosphere for the reader—its structure, movements, behavior. The author describes in exciting detail the investigations into the atmosphere, first by balloon, most recently by satellite and sounding rocket. Phenomena both common and mysterious are reported and the arguments about mankind's survival possibilities are presented.

Z

Zeilik, Michael. *Astronomy: The Evolving Universe.* Harper & Row, 1976. LC# 75-38814. ISBN 0-06-047383-5. 529pp. B/w photos and diagrams. Index. Glossary. Adult.

The fundamental concepts of astronomy are developed throughout the four major sections of this textbook for nonscience majors. The sections are: 1) Man's Conception of the Universe, 2) The Kingdom of the Sun, 3) The Universe of Stars and Galaxies, and 4) Cosmic Evolution. Within each chapter, boxes are used to develop some physical or astronomical concept more deeply than in the text.

Zim, Herbert S. *The New Moon.* Morrow, 1980. LC# 79-21896. Trade ISBN 0-688-22219-6. Library binding ISBN 0-688-32219-0. 64pp. B/w photos and art. Index. Intermediate.

A basic discussion of the Moon in our night sky, updated to cover rock collecting by astronauts and exploration by robot spacecraft—all of which have led to a new understanding of Luna. Extensive use of photos clarifies the text.

________. *The Sun.* Revised edition. Morrow, 1975. LC# 74-34461. Trade ISBN 0-688-22033-9. Library binding ISBN 0-688-32033-3. 64pp. B/w photos and art by Larry Kettelkamp. Index. Intermediate.

Information on the Sun's interior, solar energy, and ways we can use it, plus solar data obtained from high-altitude balloons, probes, and spacecraft. The illustrations are not just decorative but convey as much information as the text. Several activities are presented at the end.

________. *The Universe.* Morrow, 1973. LC# 72-14200. Hardcover ISBN 0-688-31976-9. Paperbound ISBN 0-688-25096-3. 66pp. B/w photos and art by Gustav Schrotter and René Martin. Intermediate.

Step-by-step, the author tells the story of the expansion of our view of the universe through history. The major questions still being asked are discussed.

Part III

Reference Books

Reference Books

A. General: Guides, Data Collections, and Chronologies

Allen, Jon L. *Aviation and Space Museums of America.* Arco, 1975. LC# 73-91258. Hardcover ISBN 0-668-03426-2. Paperbound ISBN 0-668-03631-1. 287pp. B/w photos. General.

Descriptions and photos of the aeronautical and space museum collections throughout the United States and Canada, arranged by section of the country. The text for each describes what a visitor might see, details the collection, and tells the location and schedule. An appendix includes addresses of related organizations and periodicals.

Corliss, William R. *Mysterious Universe: A Handbook of Astronomical Anomalies.* The Sourcebook Project, 1979. LC# 78-65616. ISBN 0-915554-05-4. 710pp. B/w photos and diagrams. Index. Adult.

A large collection of descriptions of the unusual and the controversial in astronomical observations, gathered from previously published loose-leaf notebooks. Topics include the Sun, search for Vulcan (a planet supposedly between Mercury and the Sun), the terrestrial planets, Earth, the Moon, meteors, zodiacal light, comets, stars, and cosmology. All items are quoted from sources ranging from textbooks and periodicals of a century ago to contemporary published astronaut observations.

Friedlander, Mark P., Jr., and Gene Gurney. *Higher, Faster and Farther.* Morrow, 1973; dist. by Aero. LC# 73-9377. ISBN 0-688-00204-8. 349pp. B/w photos. Introduction by Major Gen. Brooke E. Allen of the National Aeronautic Association. Secondary and up.

Since flight began, man has tried to go higher, faster, and farther. The authors provide an account in exciting detail of selected flights that achieved new records, from hot-air balloons to spaceflights. A major appendix section provides a complete listing to publication of official record flights, as accepted by the Fédération Aeronautique Internationale.

Moore, Patrick. *Astronomy Facts and Feats.* A Guinness Superlatives Book. Sterling, 1979. ISBN 0-8069-9208-5. 288pp. B/w photos and diagrams. Upper and up.

A complete collection of data about the universe and its observers, highly illustrated and containing numerous tables. The major sections are: glossary, the solar system, the stars, a star catalogue arranged by constellations, and a chronology and a who's who of astronomy. Within each area and sub-area, particularly in the section on our solar system, are numerous "firsts," "mosts," "onlies," and other superlatives.

Murphy, Lynn C. *Rockets, Missiles, and Spacecraft of the National Air and Space Museum.* Smithsonian, 1976. LC# 76-6961. 68pp. B/w photos. Bibliography. General.

A sampling in photos and text of some of the many significant rockets, satellites, engines, and spacecraft in the NASM collection. The photos used generally show the craft in action rather than on display. The text describes why the vehicle or machine is significant to aerospace history.

National Air and Space Museum Library Staff. *International Handbook of Aerospace Awards and Trophies.* Smithsonian, 1978. LC# 77-25053. 252pp. B/w photos. Index of names. Foreword by Michael Collins. General.

A compilation of all award and trophy programs related to aviation and space around the world. They are arranged alphabetically by sponsoring organization. Each is described and all recipients are identified.

Peterson, Robert W., editor. *Space: From Gemini to the Moon and Beyond.* Facts on File, 1972. LC# 78-190545. ISBN 0-87196-157-1. 323pp. Index. Secondary and adult.

"Interim History: The Bridge between Today's News and Tomorrow's History" covers the period June 1965 through 1971 in the world's space activities. An earlier volume covered the prior years. This paperbound volume details the American and Soviet space programs chronologically. Both military and scientific programs are detailed, as well as international agreements, policy and budget considerations and events.

Robinson, J. Hedley, and James Muirden. *Astronomy Data Book.* Second edition. A Halsted Press Book. Wiley, 1979. LC# 78-21698. ISBN 0-470-26594-9. 272pp. B/w diagrams and maps. Index. General.

Starting with a glossary of astronomical terms, this reference book for the amateur astronomer or student provides just about all the basic data needed. Tables cover constants, elements in celestial bodies, planetary facts. Other sections include telescopes, the Sun, the planetary bodies including recent discoveries, comets, stars, and radio astronomy.

Segel, Thomas D. *Men in Space.* Sycamore Island, 1975. LC# 75-28519. ISBN 0-87364-033-0. 201pp. Color and b/w art by Dmitri Vail. Bibliography. Upper and up.

A chronology of the United States space exploration program through portraits, quotations, and descriptive biographies of the men involved—the seventy-three men selected as astronauts before the Space Shuttle program. An appendix lists the flight crews of the Mercury, Gemini, Apollo, Skylab, and ASTP flights.

Taylor, John W. R., compiler. *Jane's Pocket Book of Research and Experimental Aircraft.* Collier, 1977. LC# 76-23522. 259pp. B/w photos. Index. Secondary and adult.

A pocket-sized volume with photo on one page and description on the next for 125 research and experimental aircraft of all nations flown since the end of World War II. In addition to construction data, the text describes special design features and the history of the vehicle.

Taylor, John W. R., and Michael J. H. Taylor. *Missiles of the World.* Revised edition. Scribners, 1977. LC# 76-9557. ISBN 0-684-14135-3. 167pp. Color and b/w photos. Index. Secondary and adult.

Each of the missiles of the world's nations is covered, in illustration, data in tabular form, and a brief description of development and service. There are also color photos of missiles being carried and launched.

Turnill, Reginald. *The Observer's Spaceflight Directory.* Warne, 1978. ISBN 0-7232-2051-4. 384pp. Color and b/w photos. Indexes. Foreword by George Low, former Deputy Administrator of NASA. General.

A small-sized but comprehensive explanatory directory of the space programs of the world, combining and expanding the previously published *Observer's Books of Manned* and *Unmanned Spaceflight.* Starts with a log of all flights from 1957 to 1976, including material on such nations as the Netherlands and Indonesia, and concludes with a summary of the research into our solar system. Numerous photos augment the text, which details every nonmilitary mission.

Wells, Helen T., Susan H. Whiteley, and Carrie E. Karegeannes. *Origins of NASA Names.* NASA History Series. SP-4402. US GPO, 1977. Stock no. 3300-00636-5. 227pp. B/w photos. Index. Secondary and adult.

An unusual illustrated look at NASA history, concerned with the names of things associated with NASA. The numerous details concern all launch vehicles, satellites, space probes, manned spaceflights, sounding rockets, and NASA installations.

Wilding-White, T. M., editor. *Jane's Pocket Book of Space Exploration.* Macmillan, 1977. LC# 76-23520. ISBN 0-02-080660-4. 238pp. B/w photos. Index. General.

A pocket-sized guide to the spacecraft and programs of the U.S., USSR, and other nations, in order by date. Each item has a photo and brief descriptive text covering dimensions, payload, mission, launch vehicle. Appendixes give the chronology of manned space programs and interplanetary probes.

B. Annuals

Aerospace Industries Association of America. *Aerospace Facts and Figures.* Distributed by Aviation Week & Space Technology. 160pp. Index. Glossary. General.

This annual review of the aerospace industry starts off with a statistical summary of the year, supplemented by tables of industry data on sales and manufacturing. Similar sections are provided on aircraft production, missile and space programs, airplane and helicopter transportation, research and development, foreign trade, employment, and finance.

Moore, Patrick, editor. *Yearbook of Astronomy.* Norton. B/w photos and diagrams. Upper and up.

An annual projection for the coming year of astronomical events, including star charts, notes on the phases of the Moon, the planets, monthly phenomena to watch for, eclipses, occultation, comets, and meteors. In addition, each year's volume includes feature articles on a variety of topics. The *1980 Yearbook,* for example, asked if life on Earth is unique and discussed the Martian dust storms during the Viking mission. In addition, each volume also includes a section describing recent advances in astronomy and space exploration.

Ottewell, Guy. *Astronomical Calendar.* Furman. B/w art by the author. Glossary. Secondary and adult.

A large (11 × 15-inch) paperbound volume, which the author calls an "American Ephemeris come to visual life." All artwork is hand-drawn and lettered by the author—sky maps for each month, diagrams of special phenomena for the month, eclipses, lunar phases, planets and asteroids as they move among the stars. The space exploration events of the previous year are described and the launch calendar for the current year is shown. *Astronomical Calendar* has been published annually since 1974. It is usable by beginners as well as more advanced amateurs, but *View from the Earth* (see below) is for younger readers.

________. *View from the Earth.* Furman. B/w art by the author. Intermediate and upper.

A basic introduction to reading the sky, for young readers or any beginner, with sky maps and special things to look for, for each month of the year. A simplified version of *Astronomical Calendar.*

U.S. NASA. *Aeronautics and Space Report of the President.* US GPO. Color and b/w photos. Secondary and adult.

Each year the President is required to report to Congress on aeronautics and space activities that occurred during the previous year. This is one of the few times in which space-related activities of all agencies, not just NASA, are linked together. It covers the work of NASA, and the departments of Defense, Commerce, Energy, Interior, and Transportation. Appendixes update each year the U.S. and world launch records and include any relevant reports. For example, the 1979 volume incorporates the full text of the United Nations Moon Treaty, in the works since 1971 and finally opened for signature in December 1979. The 1979 volume is available from US GPO, Stock no. 3300-00799-0.

________. *Spinoff.* US GPO. Color photos. Secondary and adult.

Each year since 1976 the NASA Technology Transfer Division (earlier called Technology Utilization) presents a report of the concrete benefits derived from America's space program. The books are in full color, interestingly written, with the original technology from which products or processes have derived fully described. In general, each year's volume is broken into two main parts—one covering the NASA research programs that promise future benefit of a direct nature, and a second giving many examples of indirect benefits. For example, a ship maneuvering simulator for training and retraining masters and pilots was based in part on aerospace simulation experience. *Spinoff 1980* is by James J. Haggerty. US GPO, 1980. Stock no. 3300-00789-2.

C. Atlases

(Note: Atlases of a single planet or the Moon will be found in the Subject Guide at the beginning of this book.)

Brown, Paula S., and Robert L. Garrison. *Big Blue Marble Atlas.* A Rutledge Book. Ideals, 1980. LC# 80-675234. ISBN 0-89542-924-1. 168pp. Color and b/w photos, color maps and art by John Trotta. Glossary. Index. Intermediate and upper.

A casual, fun-to-read atlas of our Earth and the solar system beyond for young people. "Big Blue Marble" is an international television program that recognizes our Earth as a big blue marble in space. The Foreword introduces the concept of "It's a small world," with things and concepts we use every day shown as originating from all over the world. Each nation or group of nations appears on a map and is then described in a section called "Geographically Speaking." Its resources are presented briefly under the heading "Naturally," and some gee-whiz information presented as "No Kidding!" Unusual land forms or habitats are described under "Map Talk." A brief "Book of Lists" at the end gives leading producers of renewable and nonrenewable resources in order of their productivity.

Moore, Patrick. *New Concise Atlas of the Universe.* Revised edition. Rand McNally, 1978. LC# 74-421. ISBN 0-528-83031-7. 192pp. Color and b/w photos and art. Index. Glossary. Foreword by Sir Bernard Lovell. Secondary and adult.

A grandly illustrated guide to the entire universe as we understand it after twenty years of space exploration, using the very pick of the available photography. In reality, this large book is four atlases in one: atlas of Earth from space, atlas of the Moon, atlas of the solar system, and atlas of the stars.

Photo Geographic International. *Photo Atlas of the United States.* Ward Ritchie Press, 1975. LC# 75-18099. Hardcover ISBN 0-0378-04690-X. Paperbound ISBN 0-0378-04692-6. 127pp. General.

The first complete photographic atlas of the U.S. using photography from Landsat, Skylab, and high-altitude aircraft. Regional maps are blue duotone from Landsat, with major features identified, plus full-color enlargements of ten major cities. Side text includes brief notes on the features indicated.

Rukl, Antonin. *Moon, Mars and Venus.* A Concise Guide in Color. Transatlantic Arts, 1976. ISBN 0-600-36219-1. 255pp. Color maps. Secondary and adult.

Primarily an atlas of the nearside of the Moon, with seventy-six sectional maps. Each section locates a number of named sites—craters, plains, mountains. Adjacent to the map each site is described and the source of the name given. The introductory material describes the surface geology, how it was mapped in the past, and the Soviet and American explorations of the Moon. Venus and Mars are given considerably briefer coverage, with only six maps of Mars and none of Venus.

D. Bibliographies

Barron, Neil, editor. *Anatomy of Wonder: Science Fiction.* Bibliographic Guide for Contemporary Collections series. Bowker, 1976. LC# 76-10260. Hardcover ISBN 0-8352-0884-2. Paperbound ISBN 0-8352-0949-0. 471pp. Indexes. Adult.

A collection of articles, each ending with a full critical annotated bibliography, on the various periods and types of science fiction books. Particularly useful for educators planning the use of science fiction in the classroom.

Bryan, M. Leonard. *Remote Sensing of Earth Resources: A Guide to Information Sources.* Vol. 1 in Geography and Travel Information Guide series. Gale, 1979. LC# 79-22792. ISBN 0-8103-1413-4. 188pp. Indexes. Glossary of abbreviations. General.

An annotated bibliography of sources of information on the remote sensing of Earth resources, primarily of recent materials since aerial photography has been a useful technique for many years. The compiler, a geography instructor and staff member at Jet Propulsion Laboratory, has divided the material into general literature, proceedings, manuals and guides, catalogs, maps, bibliographies, journals, and courses.

Kroeck, Dick. *Everyone's Space Handbook: A Photo Imagery Source Manual.* Pilot Rock, 1976. LC# 76-20041. ISBN 0-89374-000-4. 176pp. B/w photos. Bibliography. Secondary and adult.

The author, a remote sensing scientist, says that over a million frames of photography of the United States alone are added each year to the many millions already stored. This book is a guide for all people on what and where these images are and how to obtain them from both federal and private sources. Though most of the book deals with sources, two chapters explain image characteristics and the history of remote sensing.

Marotta, Michael E. *Space Colonization: An Annotated Bibliography*. Loompanics, 1979. 32pp. B/w diagrams. General.

A brief annotated bibliography on a single-track subject based on the belief that space colonization is now "inevitable and that those who prepare now will ride a wave of the future." Much of the material is basic to any coverage of contemporary aerospace planning.

Matson, Wayne R., and Julie Bettenberg, editors. The *Directory of Aviation and Space Education*. Third edition. American Society for Aerospace Education, 1980. 70pp. B/w photos. General.

A guide for educators interested in using aviation and space concepts either as motivators in the classroom or as the central theme of an entire course, at the elementary, secondary, or even higher levels. It introduces the relevant organizations that can be of assistance and lists the materials available: audiovisuals, books, periodicals, publications, career materials, and other aerospace organizations. This directory provides the information for obtaining free materials and low-cost career items, which are not listed in this Seventh Edition of NASA's *Aerospace Bibliography*.

National Geographics Society. *National Geographic Index, 1947-76*. National Geographic, 1977. LC# 71-130451. ISBN 0-87044-093-4. 451pp. Color and b/w photos. General.

This volume provides an invaluable guide to the hundreds of articles concerning astronomy and space exploration that have appeared in *National Geographic* in almost thirty years. The full-color section at the beginning of the book provides a mini pictorial history of those years of the magazine.

Sable, Martin H. *Exobiology: A Research Guide*. Green Oak Press, 1978. LC# 78-7287. ISBN 0-931600-00-6. 324pp. Indexes. Foreword by J. Allen Hynek. Adult.

A comprehensive bibliography that covers life on other planets, interstellar communications, the origin of life in the universe, the evolution of planets, and U.S. space research activities. Social, psychological, and philosophical aspects of exobiology are included, as is a special directory section listing organizations, both lay and scientific, involved in the subject.

Seal, Robert A. *A Guide to the Literature of Astronomy*. Libraries Unlimited, 1977. LC# 77-12907. ISBN 0-87287-142-8. 306pp. General.

This comprehensive, fully annotated bibliography reflects the nature of astronomy in the 1970s. Far more than just the study of the planets, Moon, Sun, and stars, it encompasses dozens of related disciplines such as physics, mathematics, computer science, chemistry, geology, and atmospheric studies. The materials included are all for the beginner or nonspecialist. Suitability of the items for use in school or public libraries is noted. The book is divided into four major sections: Reference Sources, General Materials, Descriptive Astronomy, and Special Topics. Each item included is numbered, and the number, rather than the page number, is used in the author-title and subject indexes.

U.S. NASA. *A Catalog of NASA Special Publications*. SP-449. 1981. Available from NTIS. 112pp. Secondary and adult.

A directory of all NASA Special Publications since the SP program was begun in 1961. They include the definitive coverage on the agency's research and development work, its full range of space exploration programs, its work in advancing aeronautics technology, and many associated historical and managerial efforts. Some books have become popular bestsellers but most are technical in nature. The items are listed in order of publication; there is no index. The annotations that do appear are brief. The SPs are available in original form from the U.S. Government Printing Office (if they are still in print), from the National Technical Information Service, or from COSMIC, as computer data.

White, Irvin L., et al. *Law and Politics in Outer Space: A Bibliography*. U. of Arizona Press, 1972. LC# 78-163011. ISBN 0-8165-0342-7. 176pp. Adult.

A comprehensive paperbound bibliography, without annotations, organized by types of materials (books, theses, articles, etc.) and then arranged by topic within the types. The volume begins with an introductory research guide which calls for serious political scientists to incorporate outer space into their thinking.

E. Dictionaries

Gentle, Ernest J., and Lawrence W. Reithmaier, editors. *Aviation and Space Dictionary*. Sixth edition. Aero Publishers, 1980. 272pp. B/w photos and diagrams. Foreword by Dr. Wayne R. Matson. Secondary and up.

Probably the basic dictionary for the nontechnical layperson, this volume brings together the terms used by the Air Force and NASA, in aviation, nuclear energy, meteorology, and space. This edition has incorporated even more easily understood but accurate terms from related fields such as geophysics, astronomy, and computers. An appendix pulls out in one list most of the commonly used abbreviations and acronyms.

Hopkins, Jeanne. *Glossary of Astronomy and Astrophysics*. Revised edition. U. of Chicago, 1980. LC# 80-5226. ISBN 0-226-35171-8. 224pp. Adult.

Developed by an editor of the *Astrophysical Journal*, this dictionary deals with technical terms, many of which have often seemed very esoteric but now are entering the consciousness of the public. However, her definitions remain strictly for the person involved in the field.

Illingworth, Valerie, editor. *The Facts on File Dictionary of Astronomy*. Facts on File, 1979. ISBN 0-87196-326-4. 378pp. B/w diagrams. Secondary and adult.

A complete dictionary reflecting the fantastic developments in astronomy in recent years. When formulas are used, they are fully explained. Cross-referencing is thorough. People and places important in astronomy are included along with the concepts.

Makkai, Adam, editor. *A Dictionary of Space English.* English Language Institute, 1973. LC# 73-171582. ISBN 0-8326-0004-0. 71pp. B/w photos and diagrams. Upper and up.

A straightforward dictionary, with pronunciations, parts of speech, definitions, and useful illustrations, of over 2000 terms invented, usurped from other fields, or developed from acronyms, for use in space. Brief encyclopedia-type entries are used to describe major programs and the activities of other nations. The editor's interesting introduction is an attempt to define "space English," discussing its legitimacy, derivations, and grammar.

Tver, David F., et al. *Dictionary of Astronomy, Space and Atmospheric Phenomena.* Van Nostrand, 1979. LC# 79-15372. ISBN 0-442-24045-7. 281pp. B/w diagrams. Adult.

Everything from the surface of the Earth outward, as well as the methods of studying those things, is the realm of this dictionary. The definitions are concise and up to date. While there are few illustrations, those that do appear are to the point. Cross referencing is thorough.

F. Encylopedias

Bizony, M. T., editor. *The New Space Encyclopedia: A Guide to Astronomy and Space Exploration.* Dutton, 1973. LC# 77-77915. ISBN 0-525-16629-7. 326pp. Color and b/w photos, diagrams. Secondary and adult.

A nontechnical alphabetical work with generally short but often well-illustrated entries covering both astronomy and space. The longer entries are clearly divided into subsections to facilitate locating the specific information sought. Cross referencing is done both by boldface type and by "see" notes.

Fairley, Peter. *The A-Z of Space.* Transatlantic Arts, 1975. ISBN 0-298-12044-5. 58pp. B/w photos. Upper and secondary.

A brief British encyclopedia of pre-Shuttle space that included material and photos from programs all over the world. The articles are quite brief but the illustrations are helpful. Especially useful for basic information and history.

Hurlbut, Cornelius, S., Jr., editor. *The Planet We Live On: An Illustrated Encylopedia of the Earth Sciences.* Abrams, 1976. LC# 75-29977. ISBN 0-8109-0415-2. 544pp. Color and b/w photos and diagrams. Secondary and adult.

A one-volume encyclopedia of geology, oceanography, meteorology, and lunar science presenting the recent advances that have revolutionized our thinking about the planet we live on. Fully illustrated throughout, the volume begins with a full-color portfolio of photos and art. It concludes with a guide to articles included by major subject areas, such as economic geology and meteorology.

Moore, Patrick. *The A-Z of Astronomy.* Revised edition of *The Amateur Astronomer's Glossary.* Scribners, 1977. LC# 76-58876. Hardcover ISBN 0-684-14924-9. Paperbound ISBN 0-684-14927-3. 192pp. B/w diagrams. Secondary and adult.

A handy reference guide for the astronomy reader. Half encyclopedia, half dictionary, this book includes not only the concepts but also the people and places important to astronomy. Cross referencing is done within items by the use of an asterisk.

Ridpath, Ian, editor. *The Illustrated Encyclopedia of Astronomy and Space.* Crowell, 1976. ISBN 0-690-01132-6. 240pp. Color and b/w photos, diagrams. Index. Upper and up.

A British-origin single-volume reference work created by writers who nearly all have astronomical and space books of their own listed in this Bibliography. Most of the thousands of entries are quite short, covering people, places, concepts, programs, and jargon definitions. The writing is nontechnical, and tables are used to pull together statistical information.

Satterthwaite, Gilbert E. *Encyclopedia of Astronomy.* St. Martin's, 1971. LC# 71-162370. ISBN 0-312-24605-6. 537pp. B/w photos and drawings. Foreword by Patrick Moore. Secondary and adult.

A comprehensive encyclopedia-dictionary originally from Great Britain. Including more than 2,200 entries, the subjects are of different lengths according to requirements. In addition to the technical terms of astronomy and space, people, observatories, and events are included, all intended for the intelligent lay public rather than the technically minded professional.

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